

A nighttime photograph of a city skyline reflected in water, with a large bridge in the foreground. The scene is overlaid with several overlapping purple and blue circles of varying sizes. A horizontal line of small white circles is visible across the middle of the image.

**VOLUME 4:**  
Heart Disease  
and Heart Attack  
in Oregon  
**2013**

Oregon  
**Health**  
Authority

PUBLIC HEALTH DIVISION  
Health Promotion & Chronic  
Disease Prevention Section

## **Oregon Health Authority, Public Health Division:**

**Victoria Buelow, M.A.**, Oregon Diabetes Prevention and Control Program Research Analyst

**Andrew Epstein, M.P.H., C.H.E.S.**, Oregon Diabetes Prevention and Control Program Coordinator

**Steven Fiala, M.P.H.**, Oregon Heart Disease and Stroke Prevention Program Research Analyst

**Terresa White**, Oregon Heart Disease and Stroke Prevention Program Coordinator

## **Acknowledgements, Oregon Health Authority, Public Health Division:**

**Kirsten Aird, M.P.H.**, Chronic Disease Programs Manager, Health Promotion and Chronic Disease Prevention Section

**Danna Drum, M. Div.**, Performance Manager, Office of the State Public Health Director

**Karen Girard, M.P.A.**, Section Manager, Health Promotion and Chronic Disease Prevention Section

**Bruce Gutelius, M.D., M.P.H.**, Deputy Director for Science, Center for Prevention and Health Promotion

**Holly Heiberg, M.P.P.**, Health Promotion Strategist, Health Promotion and Chronic Disease Prevention Section

**Lisa Lucas**, Research Analyst, Health Promotion and Chronic Disease Prevention Section

**Stacey Schubert, M.P.H.**, Surveillance Lead, Health Promotion and Chronic Disease Prevention Section

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Oregon Health Authority, Public Health Division

Health Promotion and Chronic Disease Prevention Section

800 N.E. Oregon Street, Suite 730

Portland, OR 97232

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This chapter summarizes the findings of Oregon’s heart disease and heart attack data system and includes the most up-to-date data on prevalence,\* deaths and hospitalizations over time and across select demographics, chronic diseases and risk factors. The intent of this chapter is to highlight the burden of heart disease and heart attack in Oregon and to assist stakeholders, policymakers and other interested parties in efforts to reduce this burden. For more information on each dataset used in this chapter, see Appendix B.

## What are heart disease and heart attack?

- ▶ Heart disease falls under a class of diseases that involve the heart or blood vessels called cardiovascular disease.<sup>1</sup>
- ▶ The term “heart disease” includes several types of heart conditions, the most common of which is “coronary heart disease.”<sup>1</sup>
- ▶ Coronary heart disease occurs when a substance called plaque (cholesterol deposits) builds up inside the arteries and restricts blood flow to the heart, which can cause angina (chest pain) or a heart attack.<sup>2</sup>
- ▶ A heart attack, also called a myocardial infarction, occurs when a section of the heart muscle dies or is damaged due to reduced blood supply.<sup>3</sup>
- ▶ Anyone can develop heart disease and eventual heart attack, but both conditions can be prevented or managed by eating a healthy diet, maintaining a healthy weight, being active, not smoking cigarettes, limiting alcohol use, and managing chronic health conditions such as diabetes, high blood pressure and high cholesterol.<sup>4</sup>
- ▶ People who experience a heart attack need emergency care such as cardiopulmonary resuscitation (CPR) or electrical shock (defibrillation); the more time that passes without treatment to restore blood flow, the greater the damage to the heart.<sup>3</sup>

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\*There is an important limitation of the heart attack prevalence estimates. In general, “prevalence” of heart attack refers to the percentage of people reporting a heart attack at a given time. This prevalence estimate is based on responses from adult Oregonians who had a heart attack, but did not die from the heart attack and are healthy enough to respond to a series of survey questions about their health and health practices. This prevalence does not capture heart attacks that resulted in death or significant disability, so it is likely an underestimate of the true heart attack prevalence in Oregon. This caveat does not apply to the numbers of heart attack deaths and hospitalizations presented in the chapter as these are based on death certificates and reports from Oregon hospitals rather than survey data.



## Who has heart disease and heart attack?

- ▶ In Oregon, an estimated 3.5% of adults reported a diagnosis of heart disease and 3.7% reported having had a heart attack in their lifetime.
- ▶ This translates to approximately 122,000 adult Oregonians with heart disease and 128,000 who had ever had a heart attack.
- ▶ Since 2005, the burden of heart disease and heart attack in Oregon remained relatively unchanged at approximately 3.5%.
- ▶ Although the percentage of Oregon adults reporting heart disease and heart attack decreased among both males and females over time, males saw greater decreases compared to females.
- ▶ Historically, Oregon has had a lower burden of heart disease and heart attack than the United States overall.

### In 2011:

- ▶ More Oregon adult males reported heart disease (4.2%) and heart attack (4.7%) compared to females (2.9% and 2.8%, respectively).
- ▶ Oregonians aged 75 years or older were more likely to report heart disease (15.2%) and heart attack (15.0%) compared to younger Oregonians aged 18–44 years (0.3% and 0.6%, respectively).
- ▶ Oregon adults with less than a high school education were nearly twice as likely to report heart disease and nearly four times as likely to report having had a heart attack compared to Oregon adults with a college degree.
- ▶ Oregon adults in households with an annual income of less than \$20,000 were nearly three times more likely to report heart disease and nearly four times more likely to report having had a heart attack compared to Oregon adults in households with an annual income of \$50,000 or more.
- ▶ Members of Oregon’s Medicaid program, Oregon Health Plan (OHP), were nearly two times more likely to report heart disease compared to individuals enrolled in private, Medicare or other health insurance, and nearly three times more likely than individuals with no health insurance.
- ▶ OHP members were two times more likely to report having had a heart attack compared to individuals with no health insurance and those enrolled in private, Medicare or other health insurance.
- ▶ Compared to non-Latino white persons, a higher percentage of non-Latino African American and non-Latino American Indian/Alaska Native persons reported heart disease and having had a heart attack compared to non-Latino white persons.
- ▶ Adult Oregonians who were obese or very obese, current cigarette smokers, or had high blood pressure or high cholesterol reported heart disease and heart attack more often than the general population of Oregon adults.
- ▶ Oregon adults with diabetes reported a heart disease and heart attack prevalence triple that of adults in the general population.

- ▶ Adults who had ever had a heart attack were 11 times more likely to report heart disease and adults with heart disease were 16 times more likely to report having had a heart attack than the general population of Oregonians.

### Risk factors for heart disease and heart attack

- ▶ Oregon adults reporting heart disease and heart attack were more likely to be obese, not engage in physical activity, have high blood pressure and high cholesterol, and have a co-occurring diagnosis of diabetes.

### Heart disease in Oregon:

- ▶ **Obesity and lack of physical activity:** Oregon adults reporting heart disease were twice as likely to be obese and not engage in physical activity compared to those without a diagnosis of heart disease.
- ▶ **High blood pressure and high cholesterol:** Adults with heart disease were nearly three times as likely to report high blood pressure and twice as likely to report high cholesterol as those without heart disease.
- ▶ **Diabetes and stroke:** Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have had a stroke and 33 times more likely to have had a heart attack compared to those who did not have heart disease.

### Heart attack in Oregon:

- ▶ **High blood pressure and high cholesterol:** Adults who had ever had a heart attack were more than twice as likely to report high blood pressure and high cholesterol as those who had not had a heart attack.
- ▶ **Diabetes and stroke:** Oregon adults who had ever had a heart attack were more than three times as likely to have diabetes and more than 21 times as likely to have heart disease as those who had not had a heart attack.

### Heart disease and heart attack hospitalizations in Oregon

- ▶ In 2011, 29,839 hospitalizations in Oregon were primarily attributed to heart disease with heart attack comprising 5,988 (20%) of these hospitalizations; heart disease accounted for 8.5% of all hospitalizations.
- ▶ An additional 92,501 individuals were hospitalized with heart disease as a non-primary diagnosis or contributing cause of hospitalization.
- ▶ The average length of stay for a person hospitalized with a primary diagnosis of heart disease in Oregon was 4.0 days and for heart attack was 3.8 days for heart attack.
- ▶ From 1997 to 2011, the heart disease and heart attack hospitalization rates decreased by 30.7% and 33.6%, respectively.
- ▶ In 2011, more than one-quarter of hospitalizations with a primary diagnosis of heart disease or heart attack had diabetes listed as a contributing cause.

- 
- ▶ From 1997 to 2011, diabetes as a contributing cause of hospitalization increased 19% among hospitalizations due to heart disease and 22.7% among hospitalizations due to heart attack.
  - ▶ In 2011, nearly two-in-three (68%) heart attack hospitalizations resulted in a discharge to home or self-care.

### **Cost of heart disease and heart attack in Oregon**

- ▶ In 2011, the average cost of a hospitalization due to heart disease in Oregon was more than \$38,000, with total medical costs exceeding \$1.1 billion.
- ▶ Males accounted for 61% of the total cost of heart disease hospitalizations; \$701.4 million and \$440.1 million were spent on heart disease hospitalizations for males and females, respectively.

### **Heart disease and heart attack mortality in Oregon**

- ▶ In 2011, heart disease was the second leading cause of death in Oregon and the leading cause of death nationally.
- ▶ From 1990 to 2010, both heart disease and heart attack death rates in Oregon were consistently lower than national rates. In recent years, the gap between Oregon and the United States has lessened.
- ▶ Since 1990, the rate of death due to heart disease and heart attack in Oregon has decreased 48.4% and 68.6%, respectively.

- ▶ In 2011, heart disease was the primary cause of death for 6,215 Oregonians, accounting for 19% of all deaths among Oregon residents.
- ▶ In the past, heart disease and heart attack death rates have been higher among men than women; however, the difference in heart disease and heart attack death rates between the two genders has decreased over time, particularly for heart attack deaths.
- ▶ In 2011, 3,360 male and 2,855 female Oregonians died from heart disease, which equates to a heart disease death rate of 178.2 deaths and 103.2 deaths per 100,000 population for males and females, respectively.
- ▶ In 2011, 626 male and 452 female Oregonians died from heart attack, which translates to a heart attack death rate of 32.2 deaths and 17.0 deaths per 100,000 population for males and females, respectively.
- ▶ In the past, heart disease and heart attack death rates have declined across all age groups; heart attack death rates have seen a larger relative decline than heart disease death rates across all age groups.
- ▶ Heart disease and heart attack death rates are higher in older age groups, particularly in those age 75 years old or older; heart disease and heart attack death rates appear to be higher among men than women in all age groups.
- ▶ From 1991 to 2009, death rates from heart disease and heart attack decreased for all racial and ethnic groups.

- ▶ Over time, the disparity in heart disease and heart attack death rates among racial and ethnic groups has lessened; however, non-Latino African American persons have had consistently higher death rates from both heart disease and heart attack compared to all other racial and ethnic groups.

### Ways to reduce the burden of heart disease and heart attack in Oregon

The Oregon Public Health Division is committed to preventing heart disease and heart attack through a wide range of evidence-based practices. The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to:

- ▶ Increase availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- ▶ Increase places where people can move about more safely;
- ▶ Increase the number of environments that are tobacco-free;
- ▶ Increase referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- ▶ Improve delivery and use of quality health care services through the physician promotion of the ABCS — appropriate **A**spirin therapy, **B**lood pressure control, **C**holesterol control, **S**moking cessation and reduced **S**odium consumption.

This comprehensive, community-wide approach makes it easier for all Oregonians to eat better, move more, and live tobacco-free wherever they live, work, play and learn.





# Heart Disease in Oregon

Approximately  
**122,000**  
adults

in Oregon have heart disease, which is the second leading cause of death in Oregon.



Heart disease costs Oregonians more than \$1 billion in hospitalizations.

Certain risk factors can worsen existing heart disease and ultimately lead to heart attack and stroke.

Among Oregon adults with heart disease:

-  **1 in 2** has diabetes.
-  **1 in 2** is obese.
-  **1 in 7** smokes cigarettes.
-  **2 in 3** have high cholesterol.
-  **3 in 4** have high blood pressure.
-  **1 in 3** is physically inactive.

## HEART DISEASE affects some communities more than others.

Compared to adults with a college degree, adults with less than a high school education are:

**2x** more likely to have heart disease.

Compared to non-Latino whites, African American, American Indian and Alaska Native people are:

**2x** more likely to have a heart attack in their lifetime.

## What are heart disease and heart attack?

Heart disease falls under a class of diseases that involves the heart or blood vessels called cardiovascular disease.<sup>1</sup> The term “heart disease” refers to several types of heart conditions.<sup>1</sup> The most common type of heart condition in the United States is coronary heart disease.<sup>1</sup> Coronary heart disease occurs when a substance called plaque builds up inside the arteries that supply blood to the heart.<sup>2</sup> Plaque is made up of cholesterol deposits, which can accumulate in the arteries. Over time, plaque can harden or rupture. Hardening plaque causes the arteries to narrow, which reduces or blocks the flow of oxygen-rich blood to the heart. If a plaque ruptures, a blood clot can form and a large blood clot can mostly or completely block blood flow through the artery.<sup>2</sup> If the flow of blood to the heart is reduced or blocked, angina or a heart attack can occur. Angina is chest pain or discomfort and is the most common symptom of coronary heart disease.<sup>5</sup> A heart attack, also called a myocardial infarction, occurs when a section of the heart muscle dies or is damaged due to reduced blood supply.<sup>3</sup>

Anyone can develop coronary heart disease that could lead to a heart attack, but both conditions can be prevented or managed by practicing certain healthy behaviors and managing existing chronic medical conditions. Not smoking cigarettes and limiting exposure to secondhand smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats can help prevent coronary heart disease and subsequent heart attack.<sup>4</sup> Coronary heart disease can also be prevented or managed by controlling or managing existing medical conditions such as high blood pressure, high cholesterol, diabetes and overweight and obesity.<sup>4</sup> In addition, those with a family history of heart disease are more susceptible to having coronary heart disease and an eventual heart attack.<sup>6</sup> The risk for heart disease can increase even more when heredity is combined with unhealthy behaviors, such as cigarette smoking and not getting enough physical activity. Those with a family history of heart disease should be aware of their increased risk for heart attack and adopt healthy behaviors and manage pre-existing chronic conditions.



## Risk factors for heart disease and heart attack

- ▶ Behaviors
  - Tobacco use;
  - Lack of physical activity;
  - Diet high in salt or trans fats;
  - Excessive alcohol use.
- ▶ Chronic conditions
  - High blood pressure;
  - High cholesterol;
  - Diabetes;
  - Overweight and obesity.
- ▶ Other
  - Family history;
  - Older age;
  - Male gender;
  - African American, Latino or American Indian/Alaska Native race and ethnicity.

People who experience a heart attack need emergency care, such as cardiopulmonary resuscitation (CPR) or electrical shock (defibrillation). The more time that passes without treatment to restore blood flow, the greater the damage to the heart.<sup>3</sup> Therefore, the chances of surviving a heart attack are greater when emergency treatment begins quickly. If signs or symptoms of a heart attack are present, 9-1-1 should be

called immediately. In 1999, almost half of cardiac deaths in the United States occurred before emergency services and hospital treatment could be administered.<sup>7</sup>

## Common heart attack signs and symptoms

- ▶ Pain or discomfort in the jaw, neck or back;
- ▶ Feeling weak, light-headed or faint;
- ▶ Chest pain or discomfort;
- ▶ Pain or discomfort in arms or shoulders;
- ▶ Shortness of breath.

Every year, about 785,000 Americans have an initial heart attack and another 470,000 have a recurrent heart attack.<sup>8</sup> It is important for heart attack survivors to control chronic conditions that may cause another heart attack, including high blood pressure, high cholesterol and diabetes through healthy lifestyle behaviors such as not cigarette smoking and engaging in physical activity.

## Heart disease is a public health priority

During the past 20 years, heart disease prevalence, hospitalizations and mortality have consistently declined in both Oregon and nationally. Still, heart disease is the second leading cause of death in Oregon and the first leading cause of death in the United States overall. In 2011, an estimated 122,640 Oregon adults reported having heart disease, and there were 29,839 hospitalizations due to heart disease with a total cost of more than \$1.1 billion. Due to the significant morbidity and mortality associated with this disease, heart

disease prevention has been identified as a key component in the Oregon Public Health Division Strategic Plan 2012–2017,<sup>9</sup> as well as the Healthy People 2020 national health plan.<sup>10</sup> The Oregon Heart Disease and Stroke Prevention Program is also a supporter of the U.S. Department of Health and Human Services Million Hearts<sup>®</sup> campaign, which began in 2012 and aims to prevent one million heart attacks and strokes by 2017.<sup>11</sup>

### Heart Disease and Stroke Prevention Program priorities

- ▶ Controlling high blood pressure and cholesterol;
- ▶ Recognizing the signs and symptoms of heart attack and stroke and taking appropriate actions;
- ▶ Improving emergency response;
- ▶ Eliminating health disparities between population groups;
- ▶ Providing facts and figures about heart disease and stroke in Oregon.

### Million Hearts<sup>®</sup> aims to prevent heart disease and stroke by:

- ▶ Improving access to effective care;
- ▶ Improving the quality of care for the ABCS — appropriate **A**spirin therapy, **B**lood pressure control, **C**holesterol control, **S**moking cessation and reduced **S**odium consumption;
- ▶ Focusing clinical attention on the prevention of heart attack and stroke;

- ▶ Activating the public to lead heart-healthy lifestyles;
- ▶ Improving the prescription adherence to appropriate medications for the ABCS.

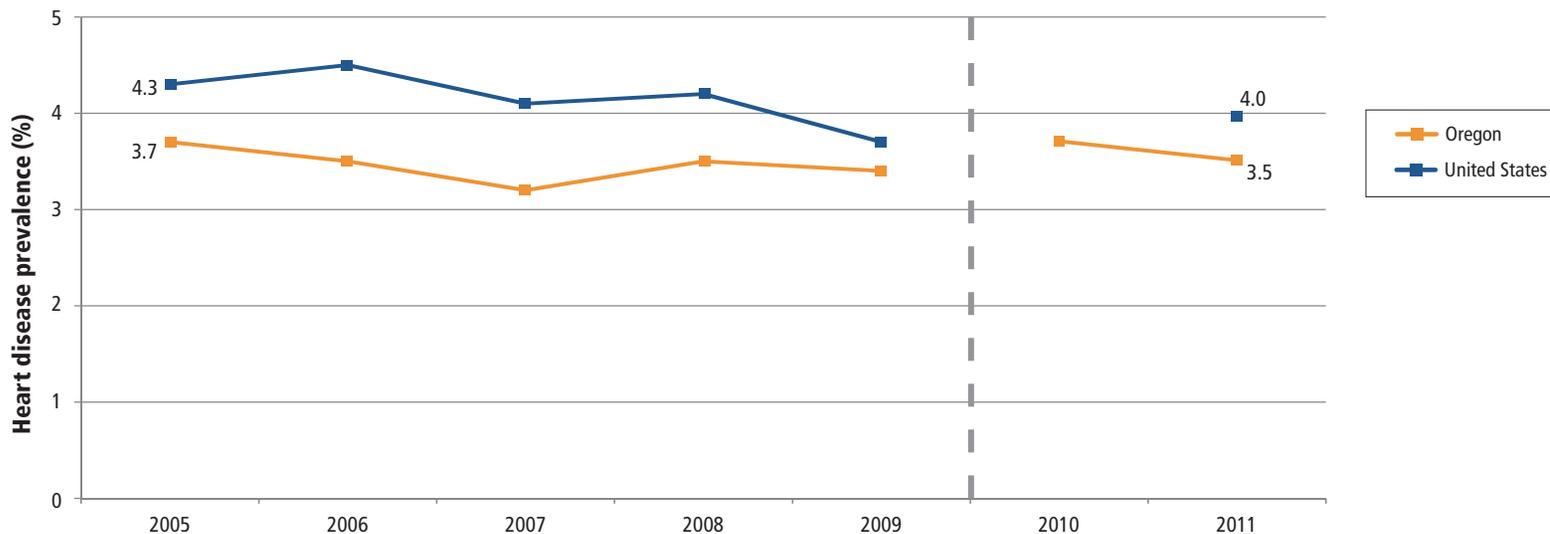
The Oregon Heart Disease and Stroke Prevention Program also developed *Oregon's Statewide Plan for Heart Disease and Stroke Prevention and Care*.<sup>12</sup> The statewide plan was completed by Oregon's Coordinating Council for Heart Disease and Stroke in order to create a vision for the prevention, early detection, treatment and self-management of these diseases and their related risk factors.<sup>12,13</sup>

## 4.1 Who has heart disease and has had a heart attack?

To understand the burden of heart disease\* and heart attack in Oregon, the prevalence+ of the diseases needs to be known.

Prevalence is the percentage of people with heart disease or heart attack in a particular population, at a given time. It is important to report the prevalence of these diseases among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups that are disproportionately

**FIGURE 4.1.1 ADULTS WITH HEART DISEASE, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**



**Data source:** Oregon Behavioral Risk Factor Surveillance System; National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

\*Throughout sections 4.1–4.3, the term heart disease specifically refers to Oregon adults who reported a diagnosis of coronary heart disease or angina.

+ For this report, heart disease prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they had angina or coronary heart disease. Heart attack prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they had a heart attack also called a myocardial infarction. This prevalence estimate is based on responses from adult Oregonians who had a heart attack, but did not die from the heart attack and are healthy enough to respond to a series of survey questions about their health and health practices. This prevalence does not capture heart attacks that resulted in death or significant disability, so it is likely an underestimate of the true heart attack prevalence in Oregon. This caveat does not apply to the numbers of heart attack deaths and hospitalizations presented in the chapter as these are based on death certificates and reports from Oregon hospitals rather than survey data.

affected by heart disease and heart attack compared to the general population in Oregon. This section will describe the burden of heart disease and heart attack among Oregon adults over time and by select demographic characteristics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

- ▶ Fewer Oregon adults reported having a diagnosis of heart disease compared with the overall U.S. population (Figure 4.1.1). This has been consistent over time, but the reason for the difference is unknown.

- ▶ Since 2005, the percentage of Oregonians who have been diagnosed with heart disease has remained steady at around 3.5% (Figure 4.1.1 and Table 4.1.1).
- ▶ During this same period, the proportion of Oregonians reporting having had a heart attack has also remained steady at around 3.5% (Table 4.1.2 and Figure 4.1.2).
- ▶ In 2011, more than 122,000 Oregon adults were estimated to have heart disease.

**TABLE 4.1.1 ADULTS WITH HEART DISEASE, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**

YEAR	OREGON HEART DISEASE	UNITED STATES HEART DISEASE
2005	3.7	4.3
2006	3.5	4.5
2007	3.2	4.1
2008	3.5	4.2
2009	3.4	3.7
2010	3.7	--
2011	3.5	4.0

**Data sources:** Oregon Behavioral Risk Factor Surveillance System; National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

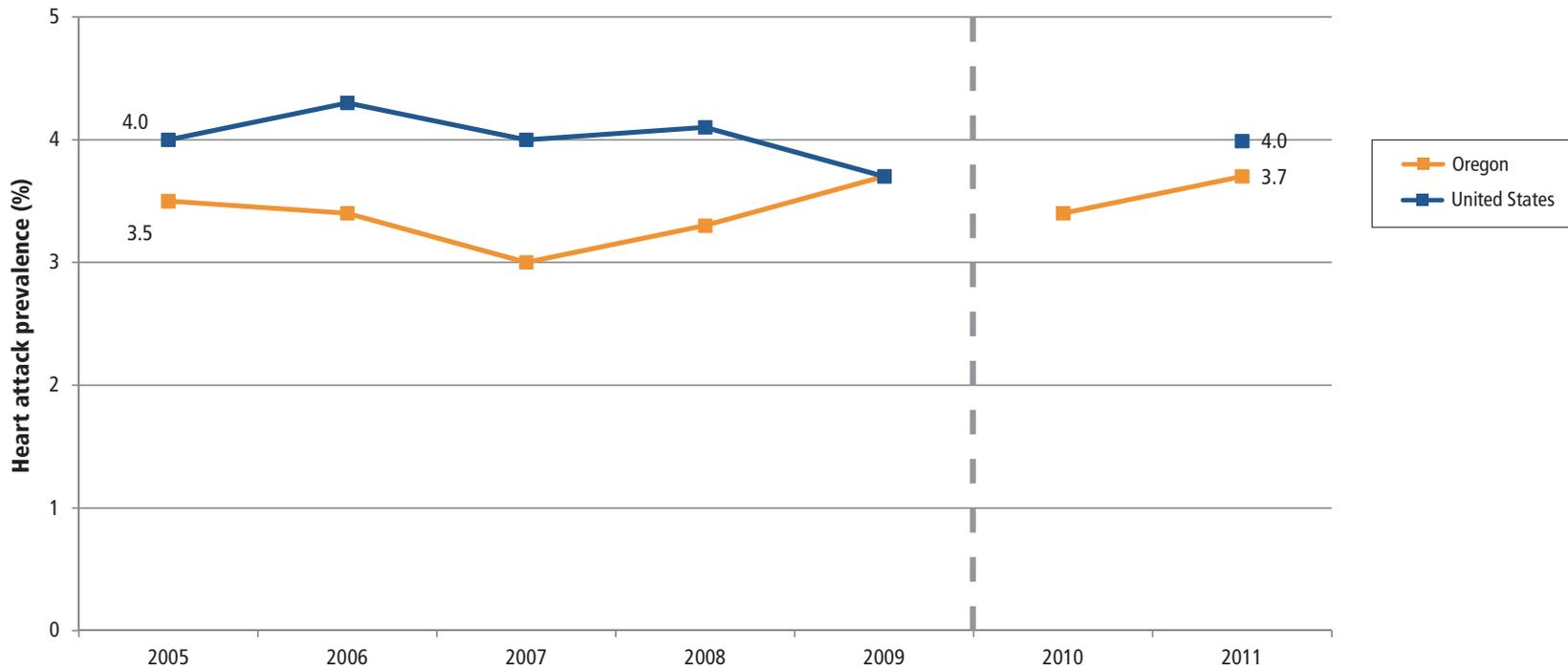
**TABLE 4.1.2 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**

YEAR	OREGON HEART DISEASE	UNITED STATES HEART DISEASE
2005	3.5	4.0
2006	3.4	4.3
2007	3.0	4.0
2008	3.3	4.1
2009	3.7	3.7
2010	3.4	--
2011	3.7	4.0

**Data sources:** Oregon Behavioral Risk Factor Surveillance System; National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

FIGURE 4.1.2 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY YEAR, OREGON VS. UNITED STATES, 2005–2011

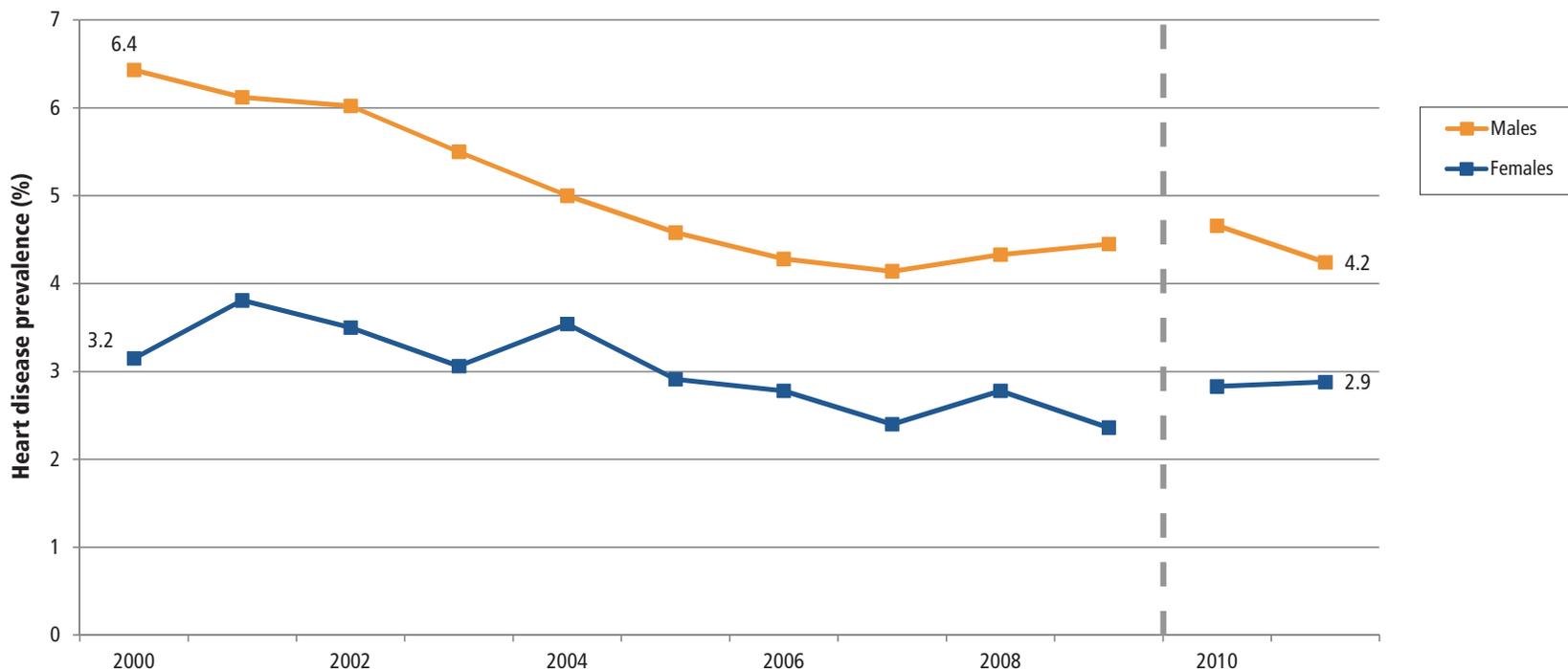


**Data source:** Oregon Behavioral Risk Factor Surveillance System; National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 as the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

- ▶ In 2011, more than 128,000 Oregonians were estimated to have had a heart attack in their lifetime.
- ▶ Fewer Oregon adults reported having had a heart attack compared with the overall U.S. population (Figure 4.1.2). This has been consistent over time, but the reason for the difference is unknown.

**FIGURE 4.1.3 ADULTS WITH HEART DISEASE, BY GENDER AND YEAR, OREGON, 2000–2011**

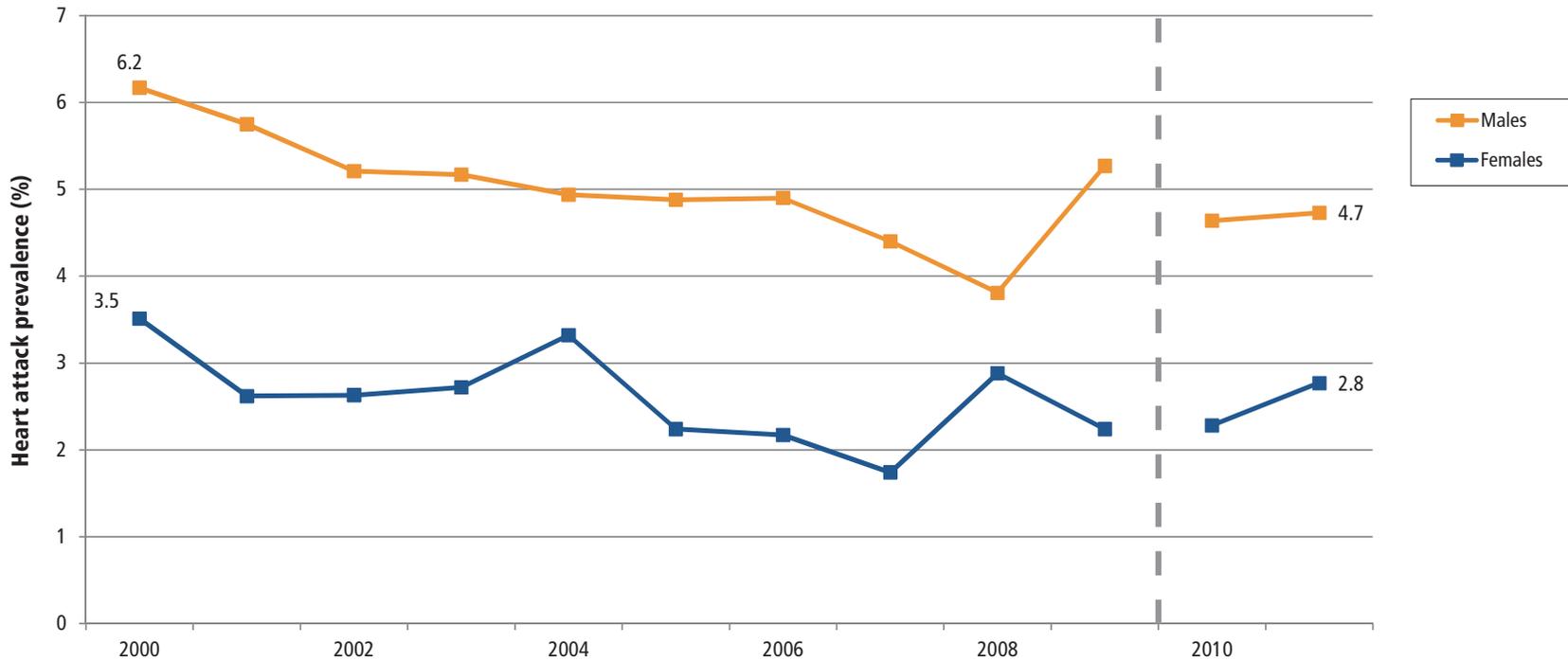


**Data source:** Oregon Behavioral Risk Factor Surveillance System.

**Notes:** The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

- ▶ Over time, a higher proportion of males than females reported having heart disease (Figure 4.1.3).
- ▶ Although the percentage of Oregon adults reporting heart disease and heart attack decreased among both males and females over time, males saw greater decreases compared to females.
- ▶ Prevalence of heart disease decreased by 34% among males and 9% among females (Figure 4.1.3).
- ▶ In 2011, an estimated 4.2% of males and 2.9% of females had heart disease (Figure 4.1.3).

**FIGURE 4.1.4 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY GENDER AND YEAR, OREGON, 2000–2011**

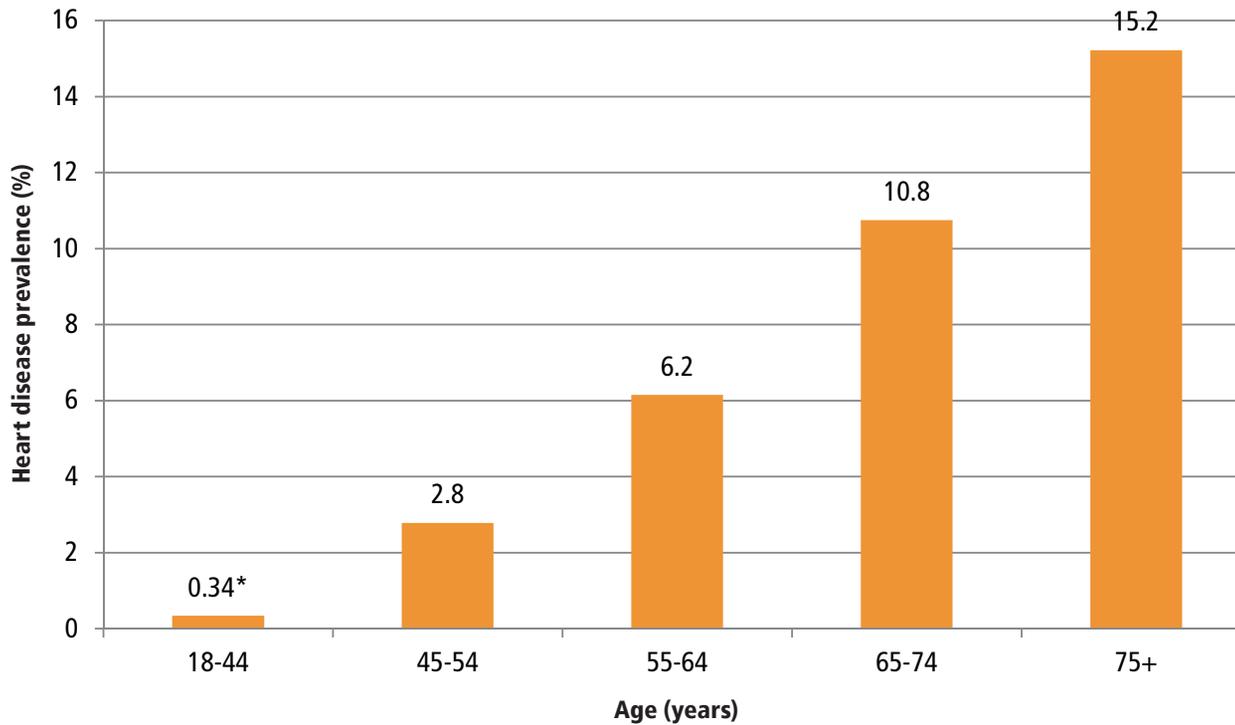


**Data source:** Oregon Behavioral Risk Factor Surveillance System.

**Notes:** The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

- ▶ In 2011, an estimated 4.7% of males and 2.8% of females reported having had a heart attack in their lifetime (Figure 4.1.4).
- ▶ Over time, a higher proportion of males than females reported having had a heart attack (Figure 4.1.4).
- ▶ Prevalence of heart attack decreased 24% among males and 20% among females (Figure 4.1.4)
- ▶ Although the percentage of Oregon adults reporting having had a heart attack decreased among both males and females over time, males saw greater decreases compared to females.

FIGURE 4.1.5 ADULTS WITH HEART DISEASE, BY AGE GROUP, OREGON, 2011



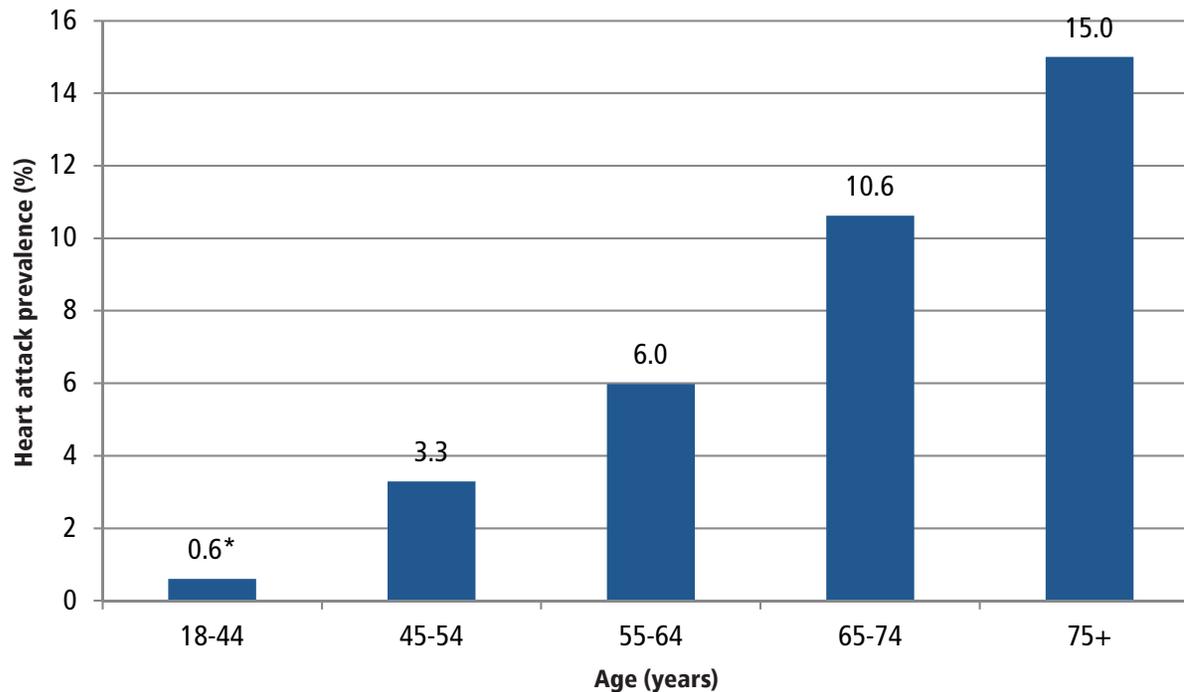
**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are not age-adjusted.

\*Estimate may be unreliable; interpret with caution.

- ▶ The percentage of adults reporting heart disease was higher in older age groups (Figure 4.1.5).
- ▶ Nearly one-in-six Oregonians aged 75 years or older reported heart disease compared to less than 1 percent of adults aged 18–44 years (Figure 4.1.5).

FIGURE 4.1.6 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY AGE GROUP, OREGON, 2011



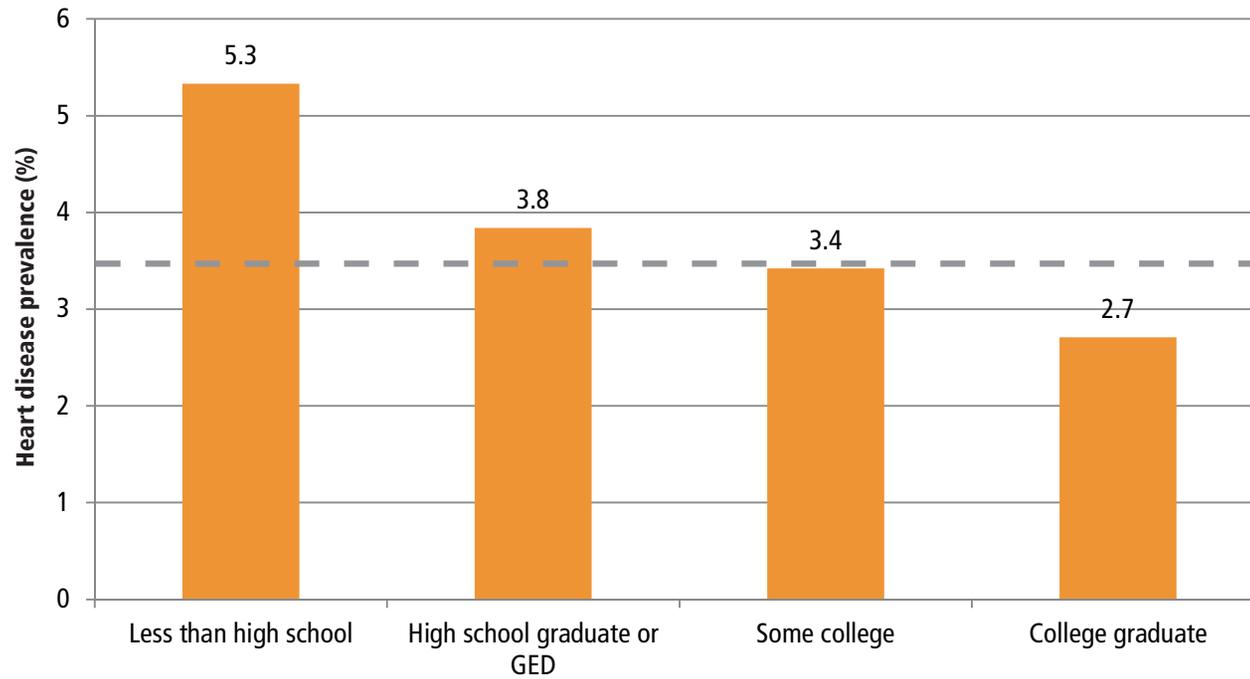
**Data source:** Oregon Behavioral Risk Factor Surveillance System.

**Notes:** Estimates are not age-adjusted.

\*Estimate may be unreliable; interpret with caution.

- ▶ The percentage of adults who have ever had a heart attack was higher in older age groups (Figure 4.1.6).
- ▶ Nearly one-in-six Oregonians aged 75 years or older reported ever having had a heart attack compared to less than 1 percent of adults aged 18–44 years (Figure 4.1.6).

FIGURE 4.1.7 ADULTS WITH HEART DISEASE, BY EDUCATION, OREGON, 2011

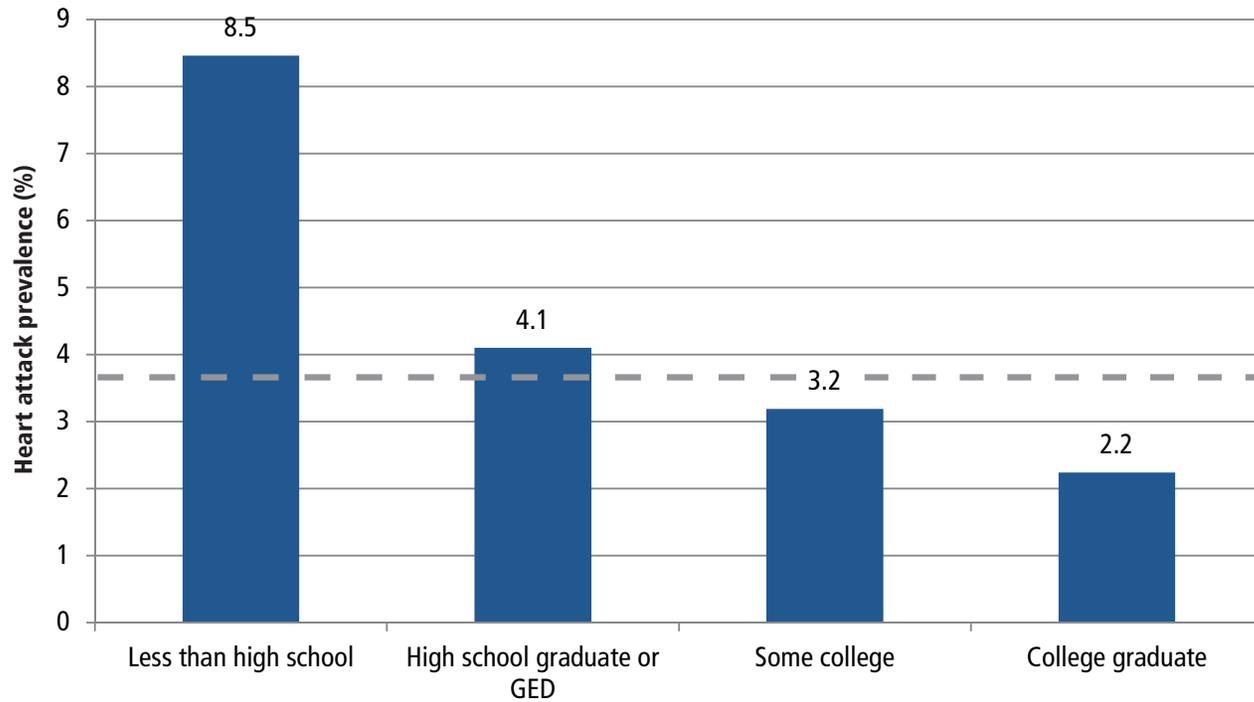


**Data source:** Oregon Behavioral Risk Factor Surveillance System.

**Notes:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.

- ▶ Oregon adults with less than a high school education were nearly two times more likely to report heart disease compared to Oregon adults with a college degree (Figure 4.1.7).

FIGURE 4.1.8 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY EDUCATION, OREGON, 2011

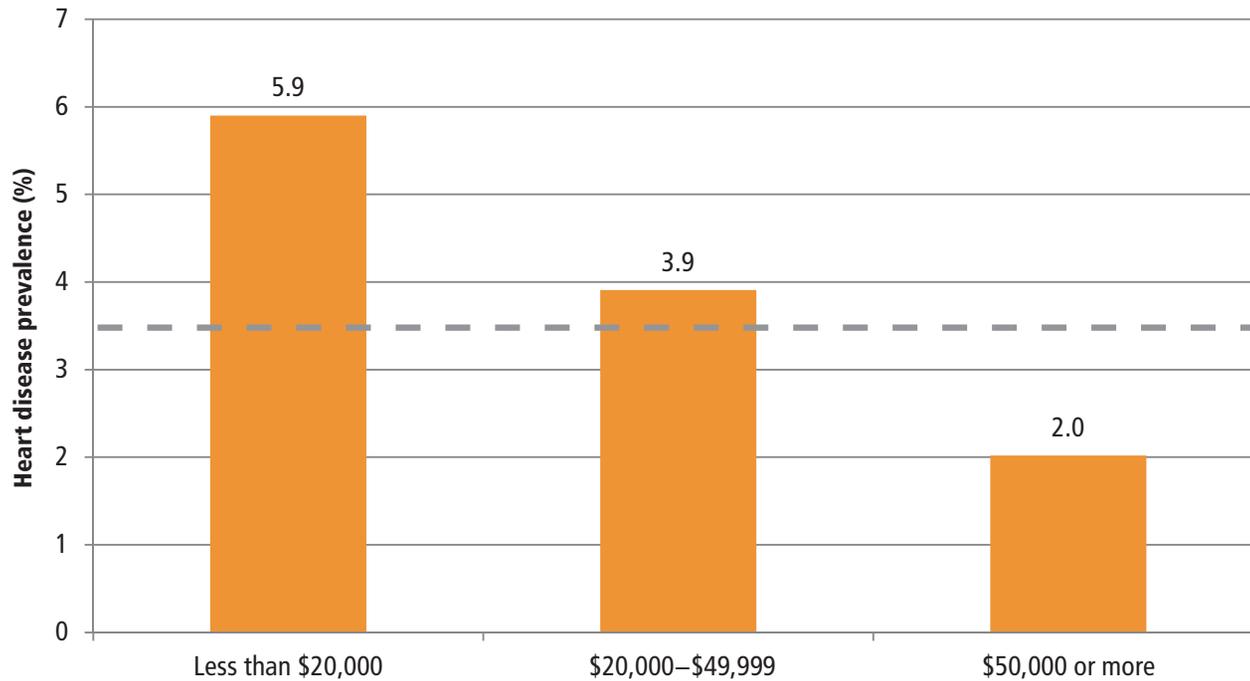


**Data source:** Oregon Behavioral Risk Factor Surveillance System.

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported a heart attack (3.7%). Estimates are age-adjusted.

- ▶ Oregon adults with less than a high school education were nearly four times more likely to report having had a heart attack compared to Oregon adults with a college degree (Figure 4.1.8).

FIGURE 4.1.9 ADULTS WITH HEART DISEASE, BY ANNUAL HOUSEHOLD INCOME, OREGON, 2011

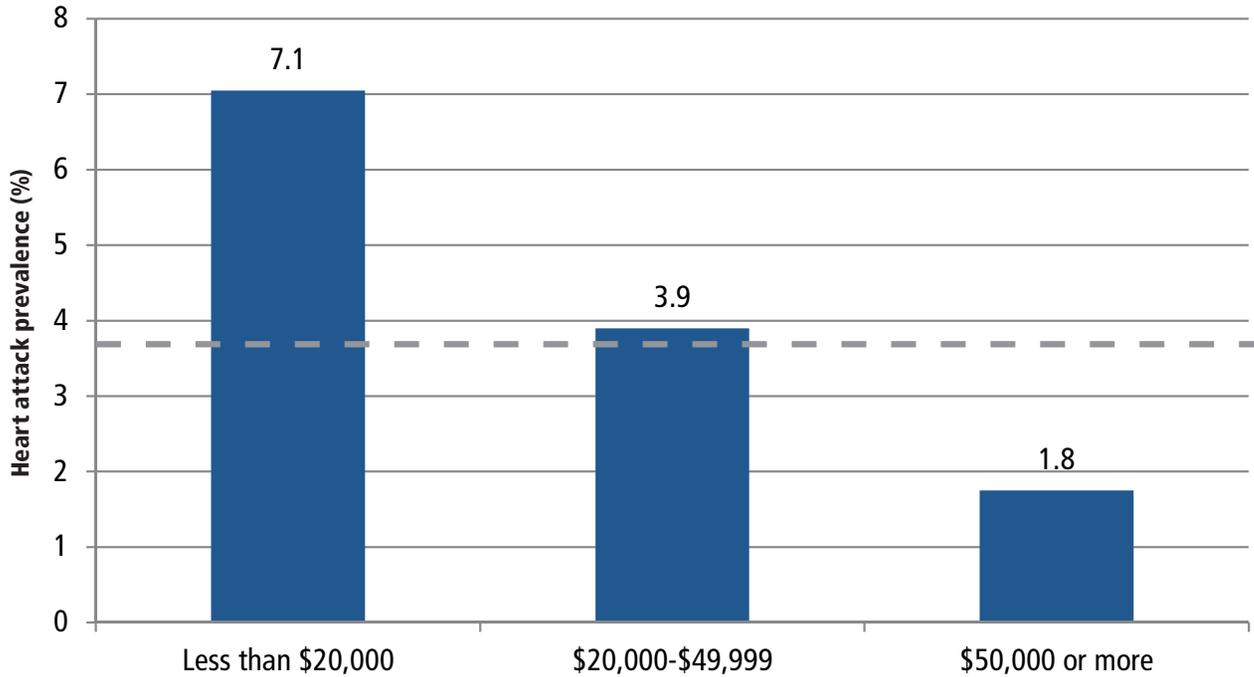


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.

- ▶ Oregon adults in households with an annual income of less than \$20,000 were nearly three times more likely to report heart disease compared to Oregon adults in households with an annual income of \$50,000 or more (Figure 4.1.9).

FIGURE 4.1.10 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY ANNUAL HOUSEHOLD INCOME, OREGON, 2011

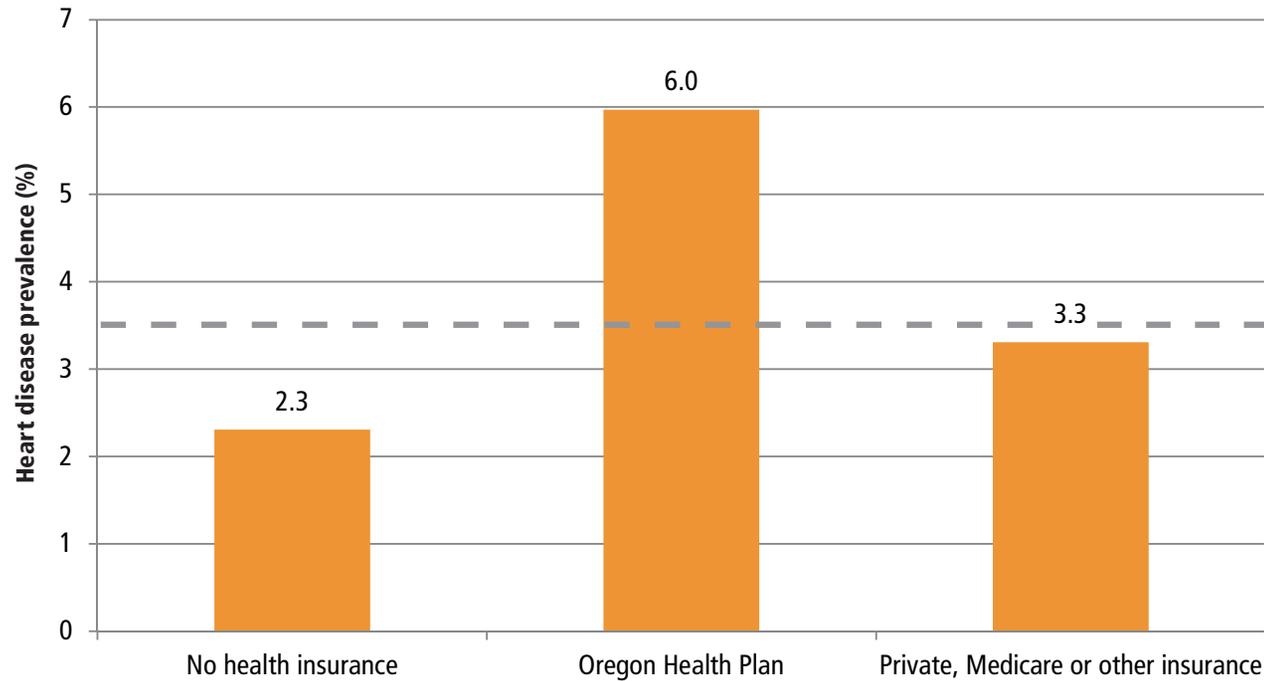


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported a heart attack (3.7%). Estimates are age-adjusted.

- ▶ Oregon adults in households with an annual income of less than \$20,000 were nearly four times more likely to report having had a heart attack compared to Oregon adults in households with an annual income of \$50,000 or more (Figure 4.1.10).

FIGURE 4.1.11 ADULTS WITH HEART DISEASE, BY CURRENT TYPE OF HEALTH INSURANCE STATUS, OREGON, 2011

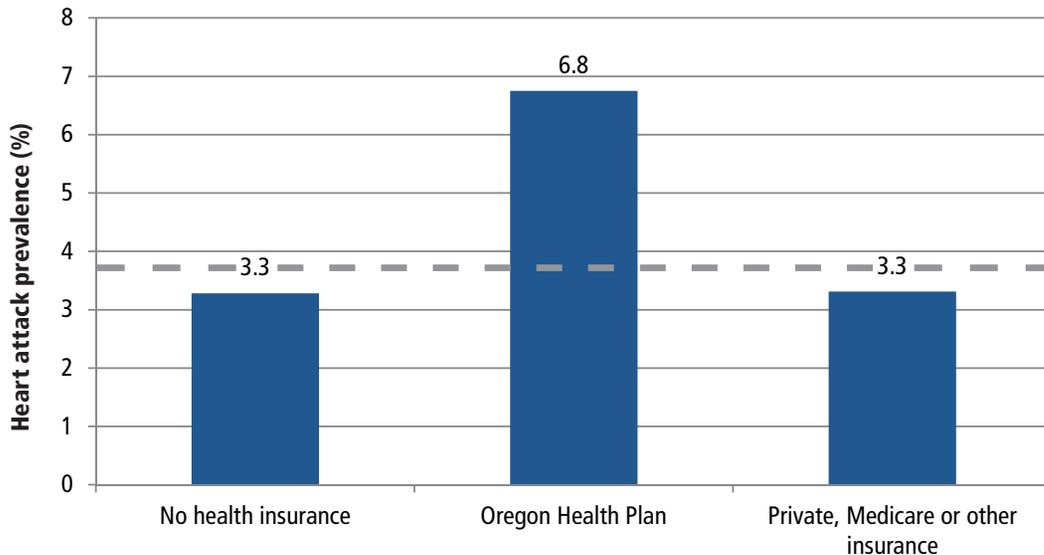


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.

- ▶ Oregon Health Plan (OHP) members were nearly two times more likely to report heart disease compared to individuals enrolled in private, Medicare or other health insurance, and nearly three times more likely than individuals with no health insurance (Figure 4.1.11).

FIGURE 4.1.12 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY CURRENT TYPE OF HEALTH INSURANCE STATUS, OREGON, 2011

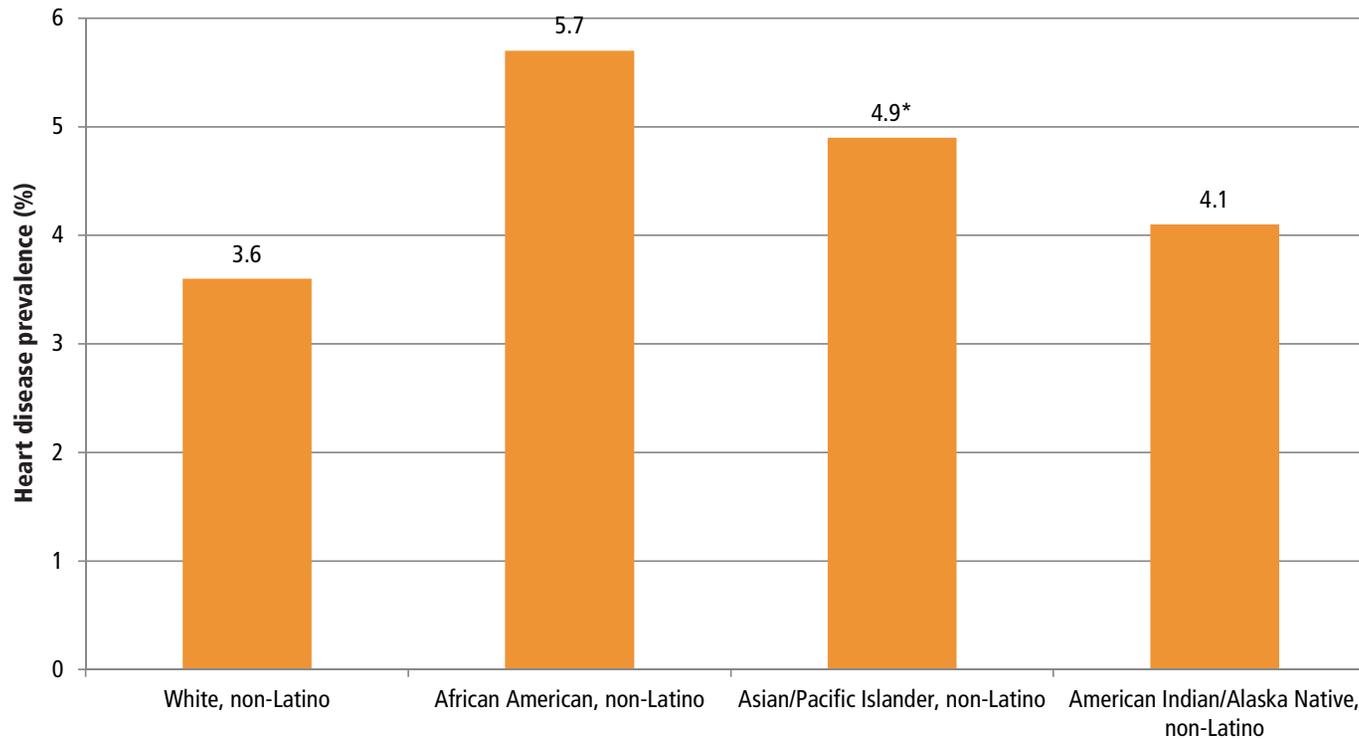


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported a heart attack (3.7%). Estimates are age-adjusted.

- ▶ OHP members were two times more likely to report having had a heart attack compared to individuals with no health insurance and those enrolled in private, Medicare or other health insurance (Figure 4.1.12).
- ▶ Those with no health insurance may have a lower prevalence of heart disease and heart attack due to inadequate access to health care. Access to care and contact with a health care provider are required to receive a diagnosis of heart disease or heart attack. In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.
- ▶ The higher prevalence of heart disease and heart attack observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population. Adult OHP members are low-income and include pregnant women, seniors and people with disabilities and are more than twice as likely to smoke as people with any other type of health insurance.<sup>14</sup> Smoking cigarettes is an important risk factor for heart disease and subsequent heart attack. OHP is intended to help ensure that medical care is affordable for those with a low income.<sup>15</sup> People with lower incomes are more likely to live in substandard housing, smoke and have higher disease morbidity.<sup>16</sup>

FIGURE 4.1.13 ADULTS WITH HEART DISEASE, BY RACE AND ETHNICITY, OREGON, 2010–2011



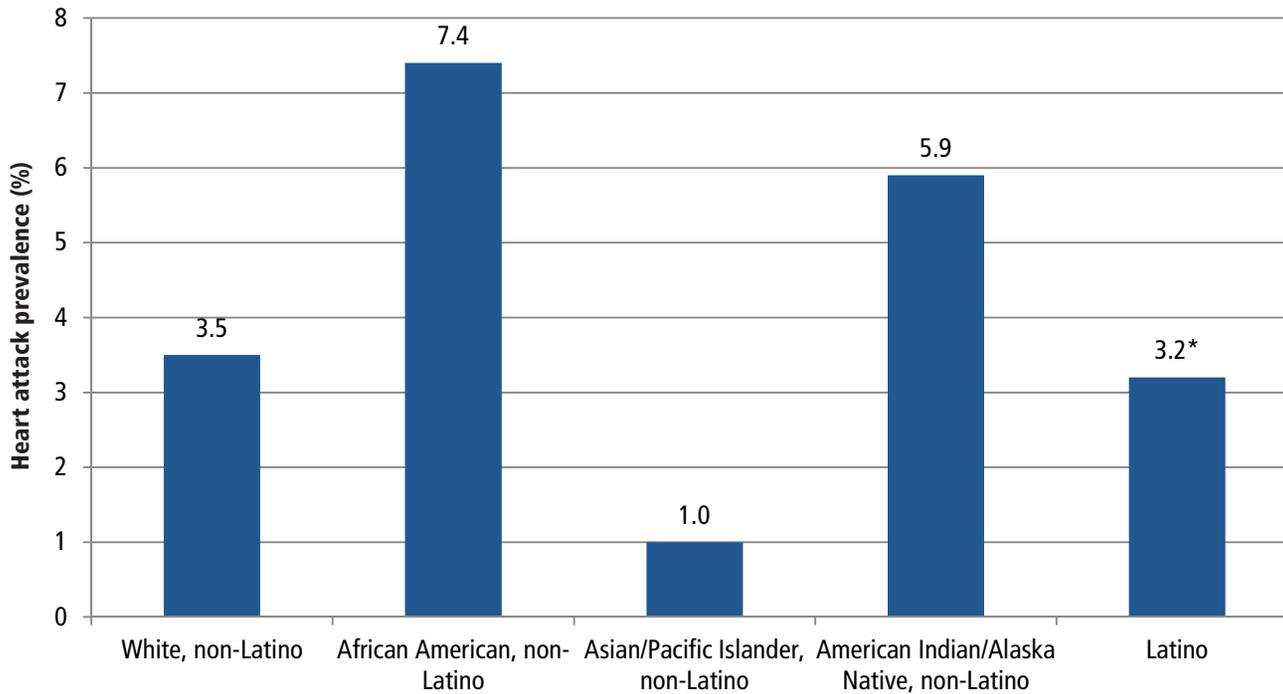
**Data source:** Oregon Behavioral Risk Factor Surveillance System Race Oversample, 2010–2011.

**Note:** Estimates are age-adjusted. The heart disease prevalence estimate for Latino ethnicity has been suppressed because it is statistically unreliable.

\*This number may be statistically unreliable and should be interpreted with caution.

- ▶ More non-Latino African American (5.7%) and non-Latino American Indian/Alaska Native (4.1%) persons reported heart disease and having had a heart attack compared to non-Latino white persons (Figure 4.1.13).
- ▶ The percentage of non-Latino African American persons reporting a diagnosis of heart disease was 58% higher than non-Latino white persons (Figure 4.1.13).

FIGURE 4.1.14 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY RACE AND ETHNICITY, OREGON, 2010–2011



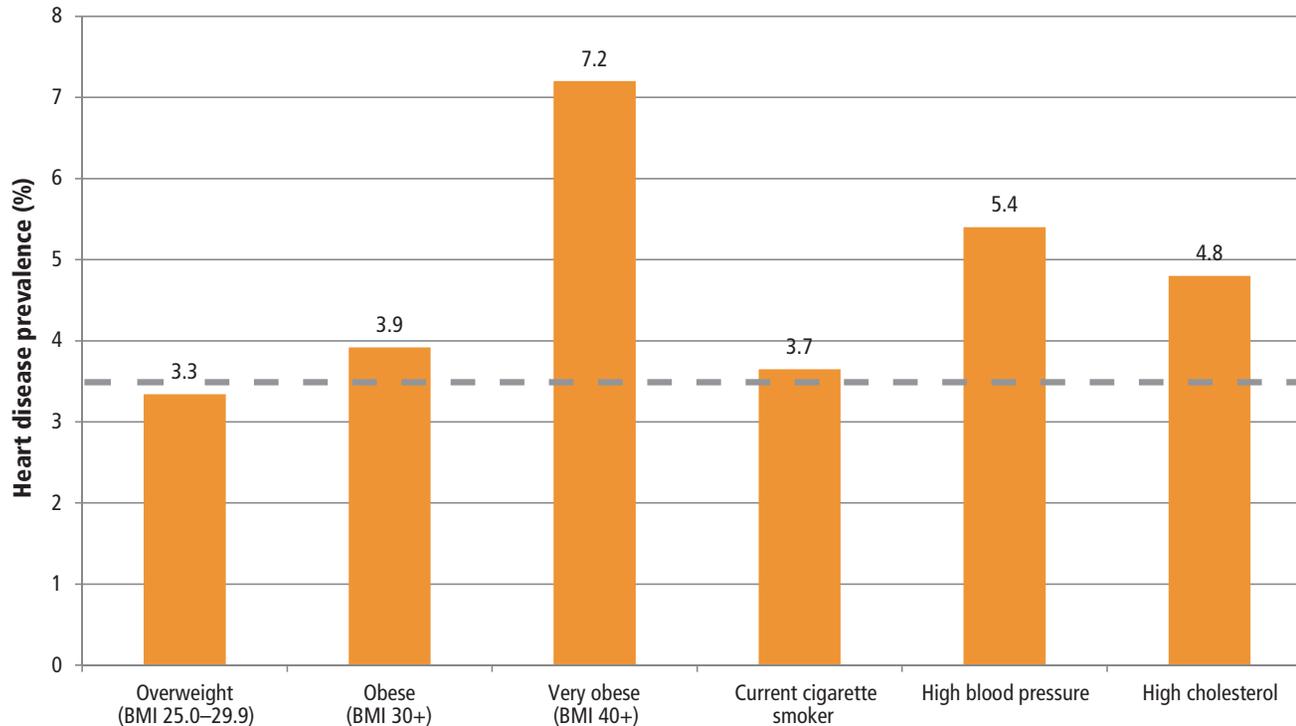
**Data source:** Oregon Behavioral Risk Factor Surveillance System Race Oversample, 2010–2011.

**Note:** Estimates are age-adjusted.

\*This number may be statistically unreliable and should be interpreted with caution.

- ▶ Non-Latino African American persons were more than twice as likely to report having had a heart attack as non-Latino white persons (Figure 4.1.14).
- ▶ A similar proportion of Latino and non-Latino white persons reported having had a heart attack (Figure 4.1.14).

**FIGURE 4.1.15 ADULTS WITH HEART DISEASE, BY SELECTED HEART DISEASE RISK FACTORS, OREGON, 2011**



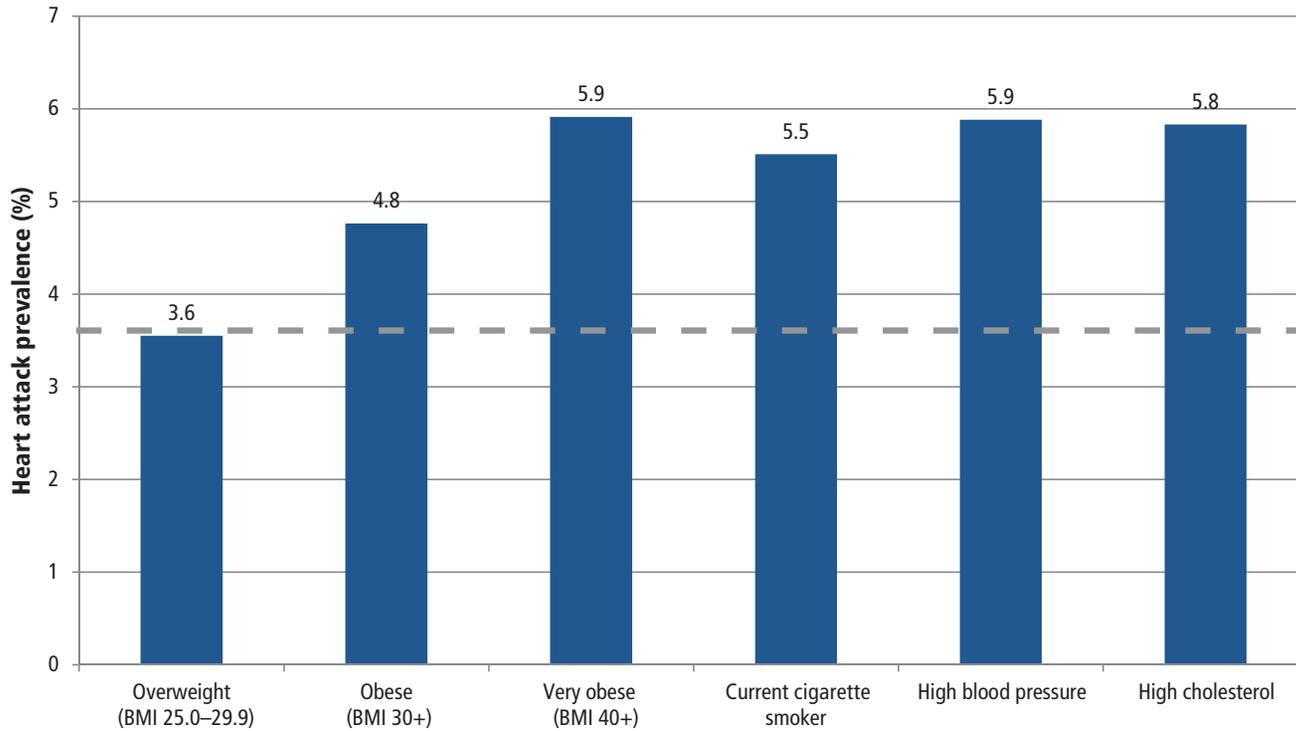
**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.

- ▶ Oregon adults who were very obese were more than twice as likely as the general adult population to report heart disease and 59% more likely to report having had a heart attack (Figure 4.1.15).
- ▶ The prevalence of heart disease was 54% higher among Oregon adults with high blood pressure and 37% higher among those with high cholesterol compared to the general population (Figure 4.1.15).
- ▶ Adult Oregonians who were obese or very obese,\* current cigarette smokers, or had high blood pressure or high cholesterol reported heart disease more often than the general population (Figure 4.1.15).

\*To determine adult overweight and obesity ranges, self-reported weight and height are used to calculate Body Mass Index (BMI), since for most people it correlates with the amount of body fat a person has, although it is not a direct measure of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, 30 to 39.9 is considered obese, and 40.0 and above is considered very obese.

FIGURE 4.1.16 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY SELECTED HEART ATTACK RISK FACTORS, OREGON, 2011

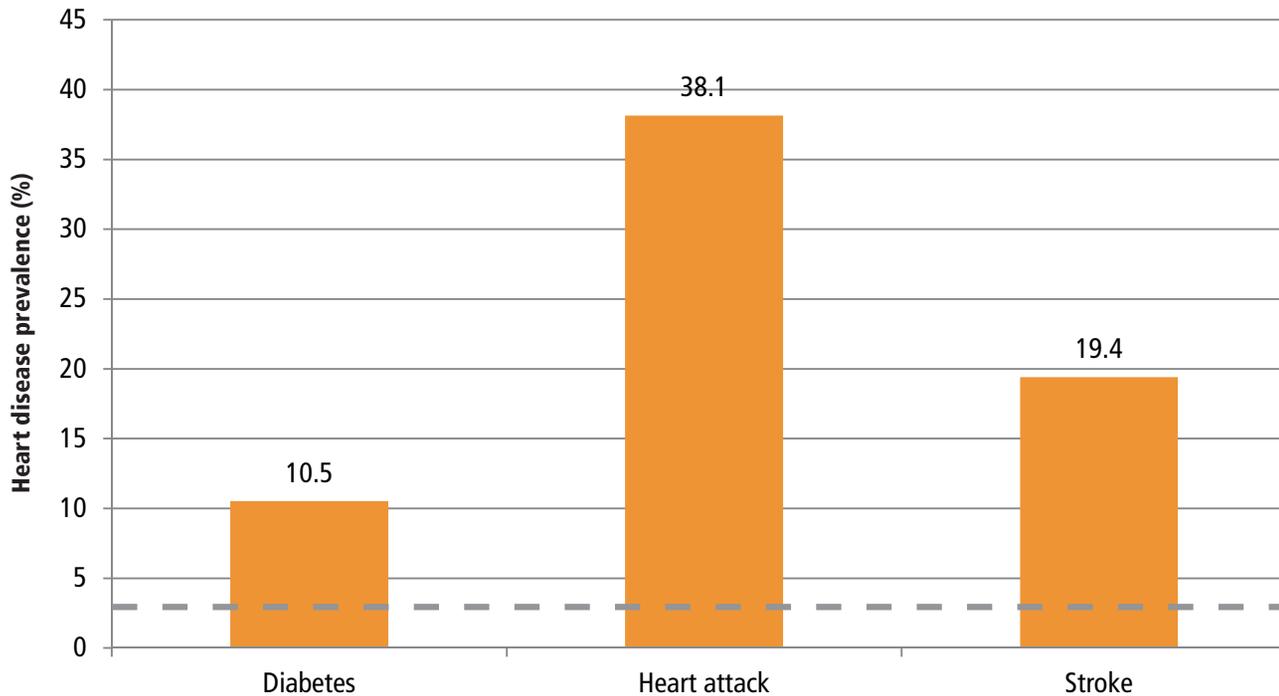


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population who reported a heart attack (3.7%). Estimates are age-adjusted.

- ▶ Adult Oregonians who were obese or very obese, current cigarette smokers, or had high blood pressure or high cholesterol reported having had a heart attack more often than the general population (Figure 4.1.16).
- ▶ The prevalence of heart attack was 59% higher among Oregon adults with high blood pressure and 57% higher in those with high cholesterol compared to the general population of Oregon adults (Figure 4.1.16).
- ▶ Although it appears that Oregon adults who smoke reported a similar prevalence of heart disease as the general population, those who smoke were 49% more likely to report having had a heart attack (figures 4.1.15 and 4.1.16).

FIGURE 4.1.17 ADULTS WITH HEART DISEASE, BY SELECTED CHRONIC DISEASES, OREGON, 2011



**Data source:** Oregon Behavioral Risk Factor Surveillance System

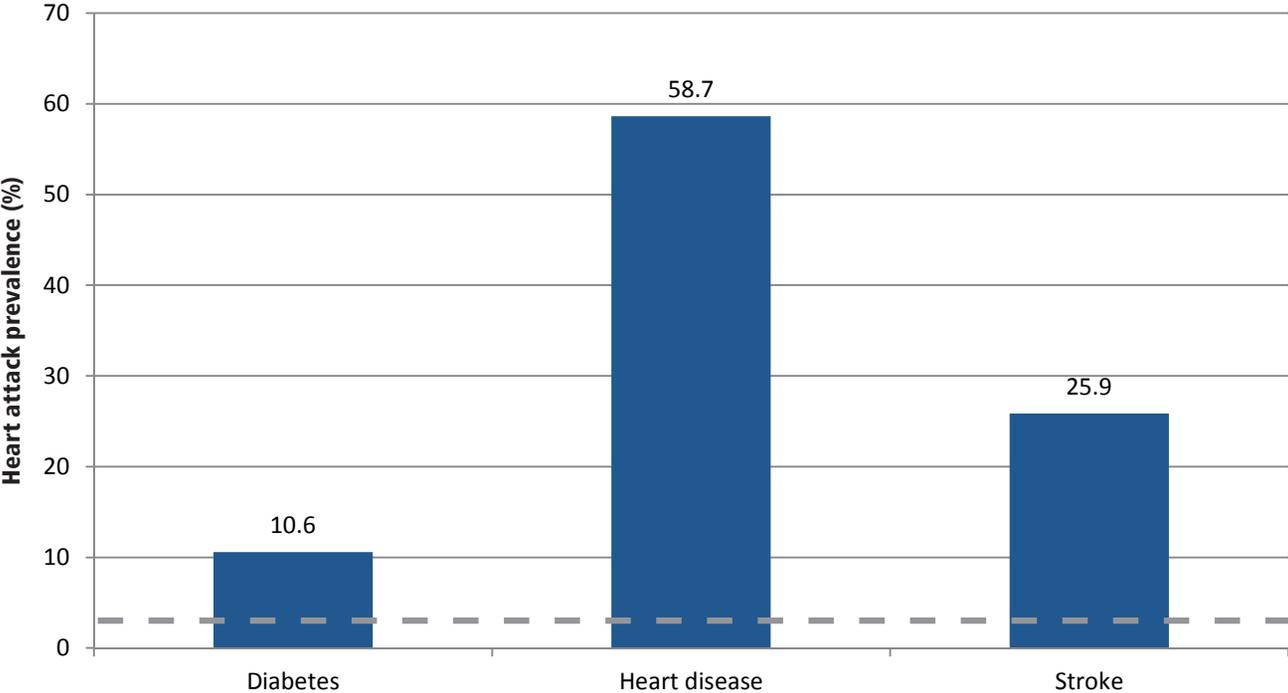
**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.

- ▶ Oregon adults with diabetes had a heart disease prevalence triple that of adults in the general population (Figure 4.1.17).
- ▶ Oregon adults who had ever had a stroke were five times more likely to have heart disease (Figure 4.1.17).
- ▶ Heart disease is especially common among those who have had a heart attack in their lifetime because heart disease is a precursor to heart attack and the two conditions are components of the same disease process. Adults who

have had a heart attack were 11 times more likely to report heart disease and adults with heart disease were 16 times more likely to report having had a heart attack than the general population of Oregonians (figures 4.1.17 and 4.1.18).



**FIGURE 4.1.18 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY SELECTED CHRONIC DISEASES, OREGON, 2011**

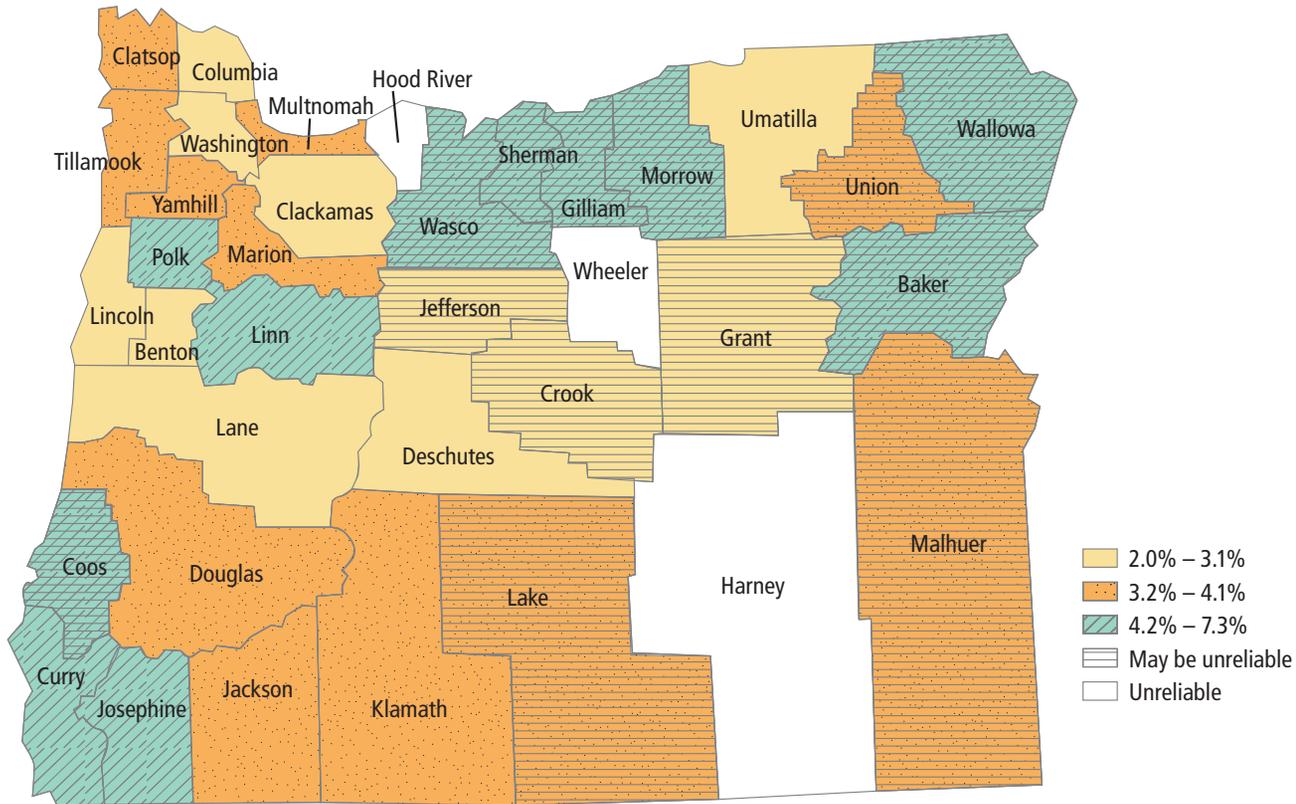


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population who reported a heart attack (3.7%). Estimates are age-adjusted.

- ▶ Oregon adults with diabetes had a heart attack prevalence triple that of adults in the general population (Figure 4.1.18).
- ▶ Oregon adults who had ever had a stroke were seven times more likely to report having had a heart attack (Figure 4.1.18).

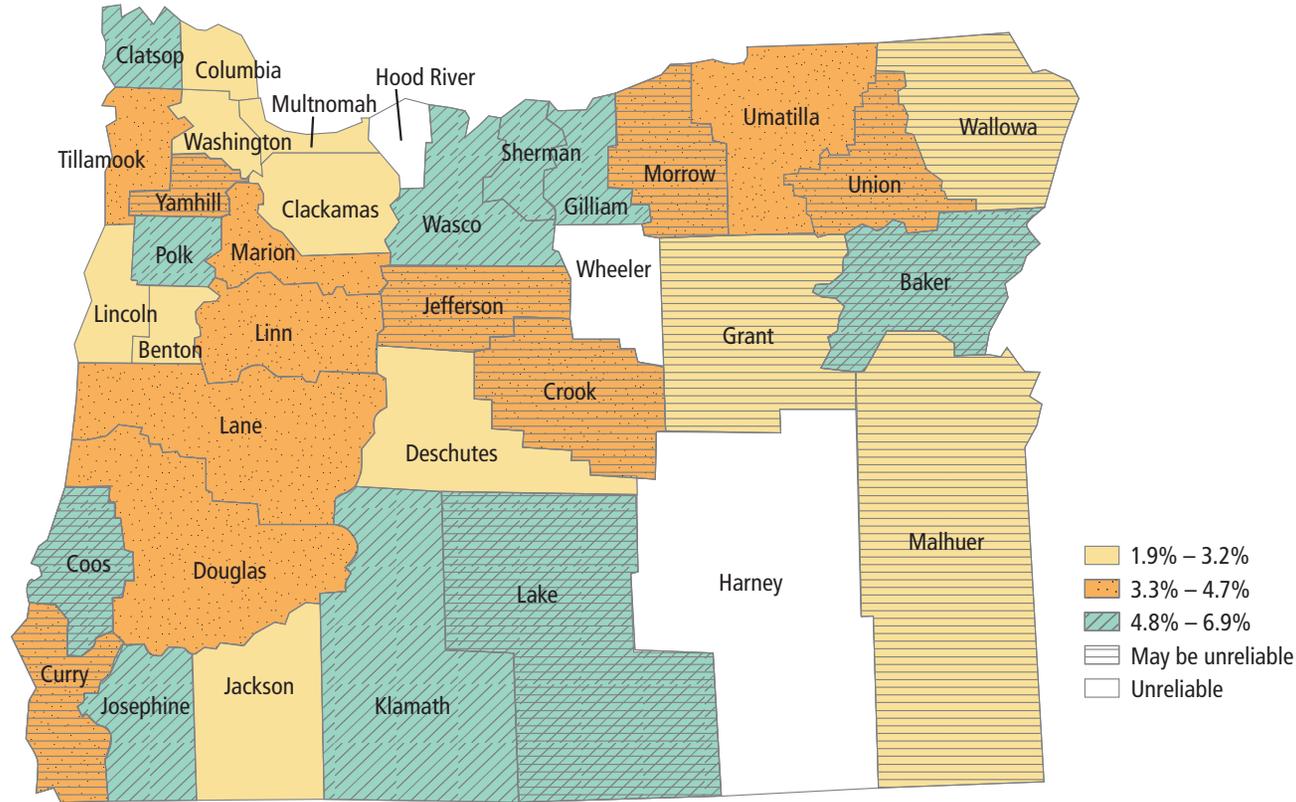
**FIGURE 4.1.19 ADULTS WITH HEART DISEASE, BY COUNTY, OREGON, 2008–2011**



**Data source:** Oregon Behavioral Risk Factor Surveillance System County Combined File  
**Note:** Estimates are age-adjusted. The state heart disease prevalence for 2008–2011 was 3.5%.

- ▶ During 2008–2011, the prevalence of heart disease among Oregon counties ranged from 2.0% to 7.3%.
- ▶ Benton, Clackamas and Umatilla counties had significantly lower percentages of adults with diagnosed heart disease compared to the rest of the state.
- ▶ See Appendix A for detailed county estimates of heart disease prevalence.

**FIGURE 4.1.20 ADULTS WITH DIAGNOSED HEART ATTACK, BY COUNTY, OREGON, 2008–2011**



**Data source:** Oregon Behavioral Risk Factor Surveillance System county combined file

**Note:** Estimates are age-adjusted. The state heart attack prevalence for 2008–2011 was 3.3%.

- ▶ During 2008–2011, the prevalence of diagnosed heart attack among Oregon counties ranged from 1.9% to 6.9%.
- ▶ Clackamas, Deschutes, Multnomah and Washington counties had significantly lower percentages of adults with diagnosed heart attack compared to the rest of the state.
- ▶ Douglas, Klamath and Polk counties had significantly higher percentages of adults with diagnosed heart attack compared to the rest of the state.
- ▶ See Appendix A for detailed county estimates of heart attack prevalence.

## Conclusions

The percentage of Oregon adults who have heart disease and have had a heart attack has remained relatively consistent over time, and is historically lower than adults in the rest of the United States. Many groups of Oregonians are disproportionately affected by heart disease and heart attack, including males, African American persons, those with less education and a smaller annual household income, and those enrolled in the Oregon Health Plan. Oregon adults with chronic disease risk factors and other chronic conditions were also more likely to report having heart disease and having had a heart attack than the general population. Oregon adults who were very obese were two times more likely than the general adult population to report heart disease, and the prevalence of a heart attack was 59% higher among Oregon adults with high blood pressure.



## 4.2 Risk factors among the heart disease and heart attack population

Many Oregon adults who reported a diagnosis of heart disease or having had a heart attack are affected by risk factors such as high blood pressure, high cholesterol, obesity and cigarette smoking that can lead to the development of additional chronic disease and increase the chance for another heart attack. Understanding the disproportionate burden of chronic disease risk factors and other chronic diseases among the heart disease and heart attack population will inform the prevention and treatment of these conditions. This section will describe the burden of chronic disease risk factors and other chronic conditions among Oregon adults who have reported heart disease or having had a heart attack.



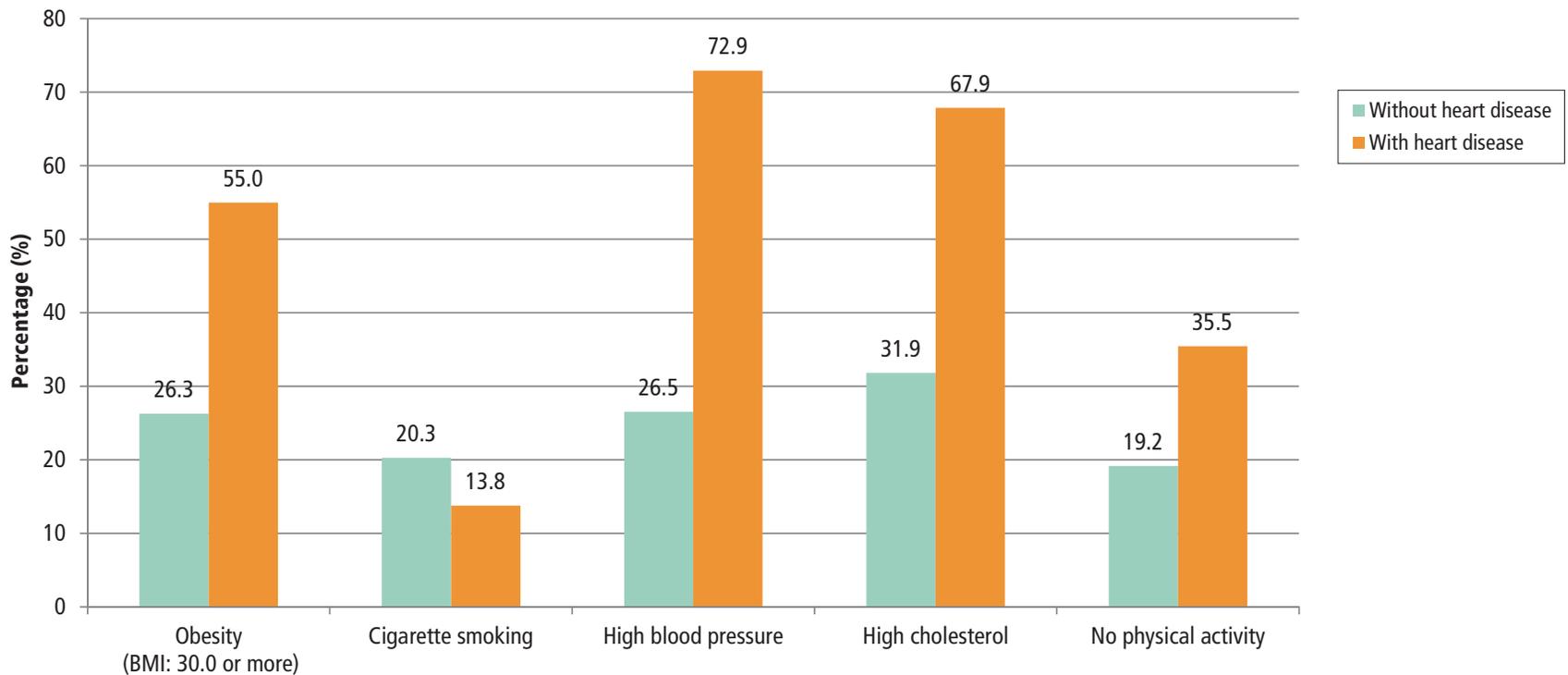
As shown, of adults without heart disease, 26.3% were obese; of adults with heart disease, 55% were obese.

- ▶ Oregon adults reporting heart disease were twice as likely to be obese and not engage in physical activity compared to those without a diagnosis of heart disease (Figure 4.2.1).
- ▶ Nearly three-in-four Oregon adults with a diagnosis of heart disease also reported high blood pressure; adults

with heart disease were nearly three times more likely to report high blood pressure than those without heart disease (Figure 4.2.1).

- ▶ Approximately two-in-three Oregon adults with heart disease also reported high cholesterol; adults with heart disease were more than twice as likely to report high cholesterol as adults without heart disease (Figure 4.2.1).

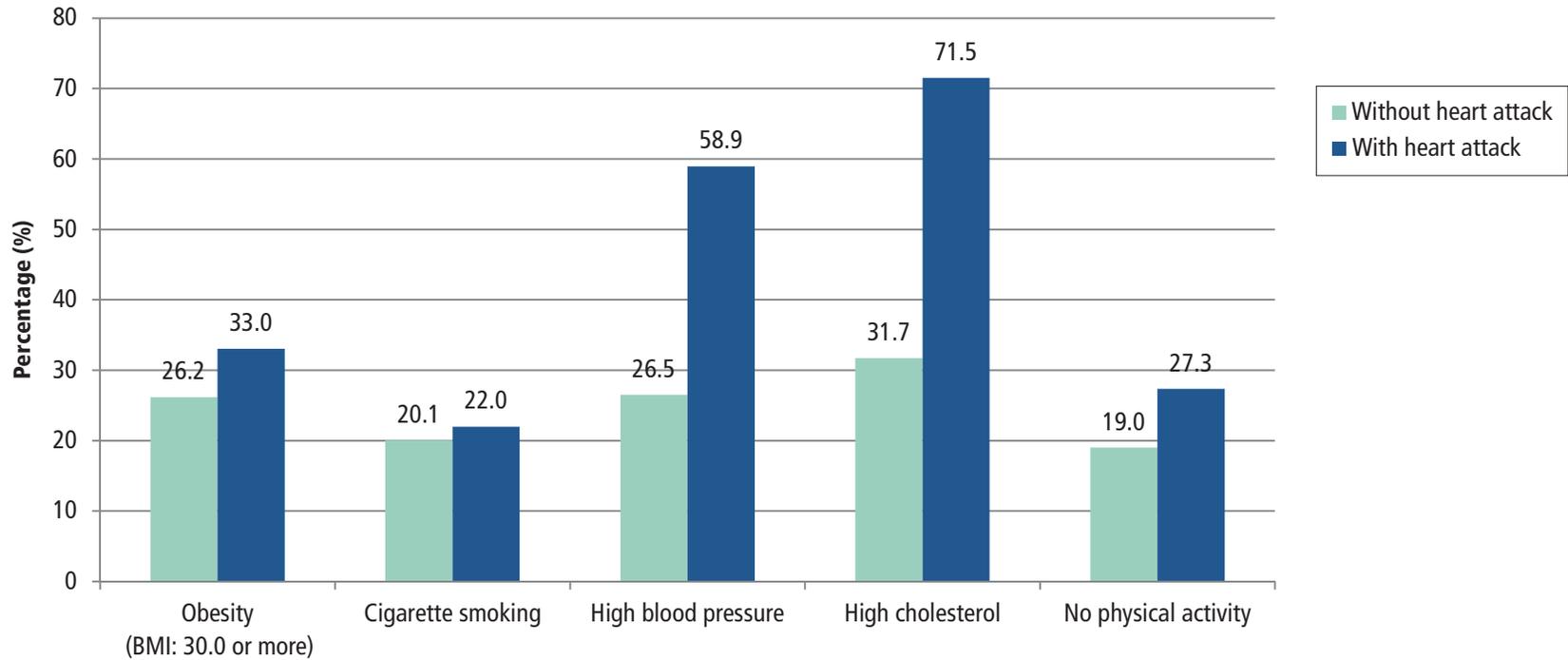
**FIGURE 4.2.1 SELECTED CHRONIC DISEASE RISK FACTORS AMONG ADULTS WITH HEART DISEASE, OREGON, 2011**



**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted.

FIGURE 4.2.2 SELECTED CHRONIC DISEASE RISK FACTORS AMONG ADULTS WHO HAD EVER HAD A HEART ATTACK, OREGON, 2011



**Data source:** Oregon Behavioral Risk Factor Surveillance System

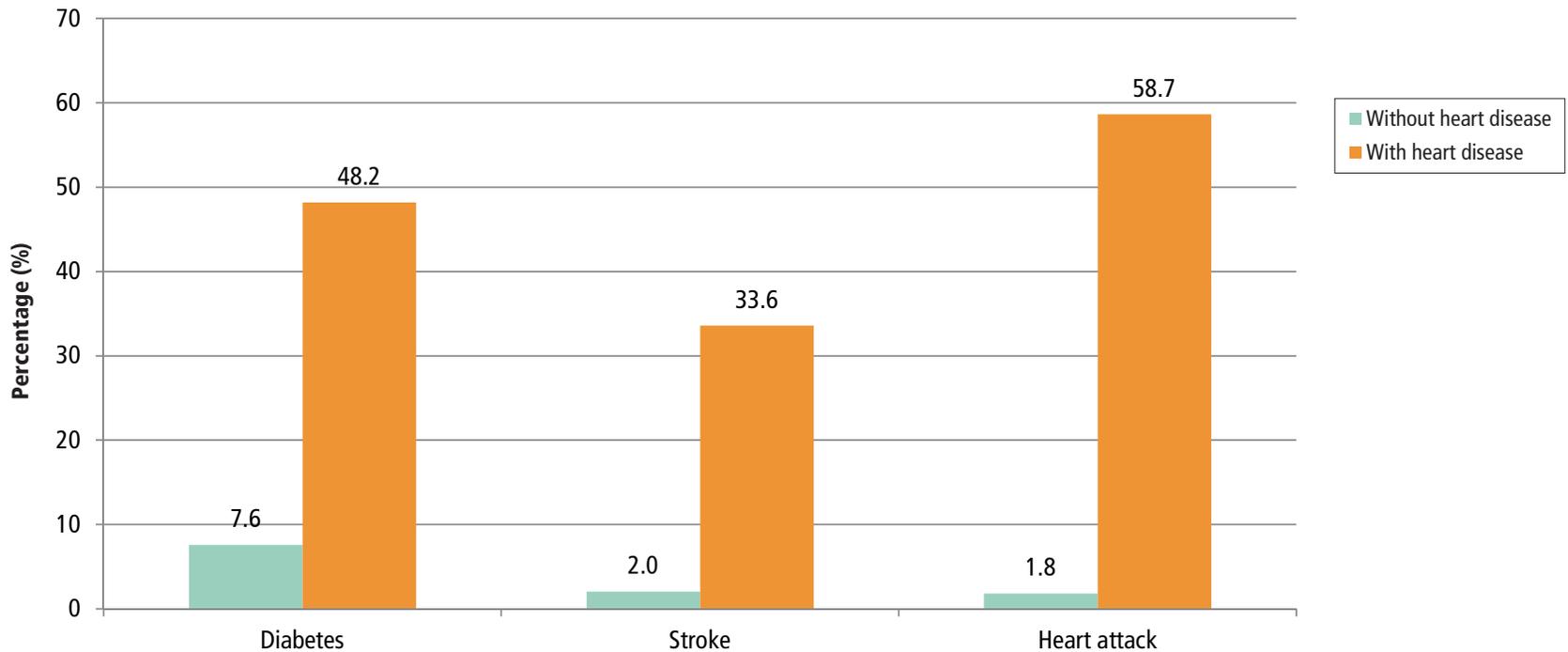
**Note:** Estimates are age-adjusted.

As shown, of adults who had not had a heart attack, 26.2% were obese; of adults who had ever had a heart attack, 33% were obese.

▶ A little more than half of Oregon adults who had had a heart attack in their lifetime reported high blood pressure; adults who had ever had a heart attack were more than twice as likely to report high blood pressure as those without a history of heart attack (Figure 4.2.2).

▶ Nearly three-in-four adult Oregonians who had ever had a heart attack also reported having high cholesterol; adults who had ever had a heart attack reported high cholesterol more than twice as much as adults who have never had a heart attack (Figure 4.2.2).

FIGURE 4.2.3 SELECTED CHRONIC DISEASES AMONG ADULTS WITH HEART DISEASE, OREGON, 2011



**Data source:** Oregon Behavioral Risk Factor Surveillance System

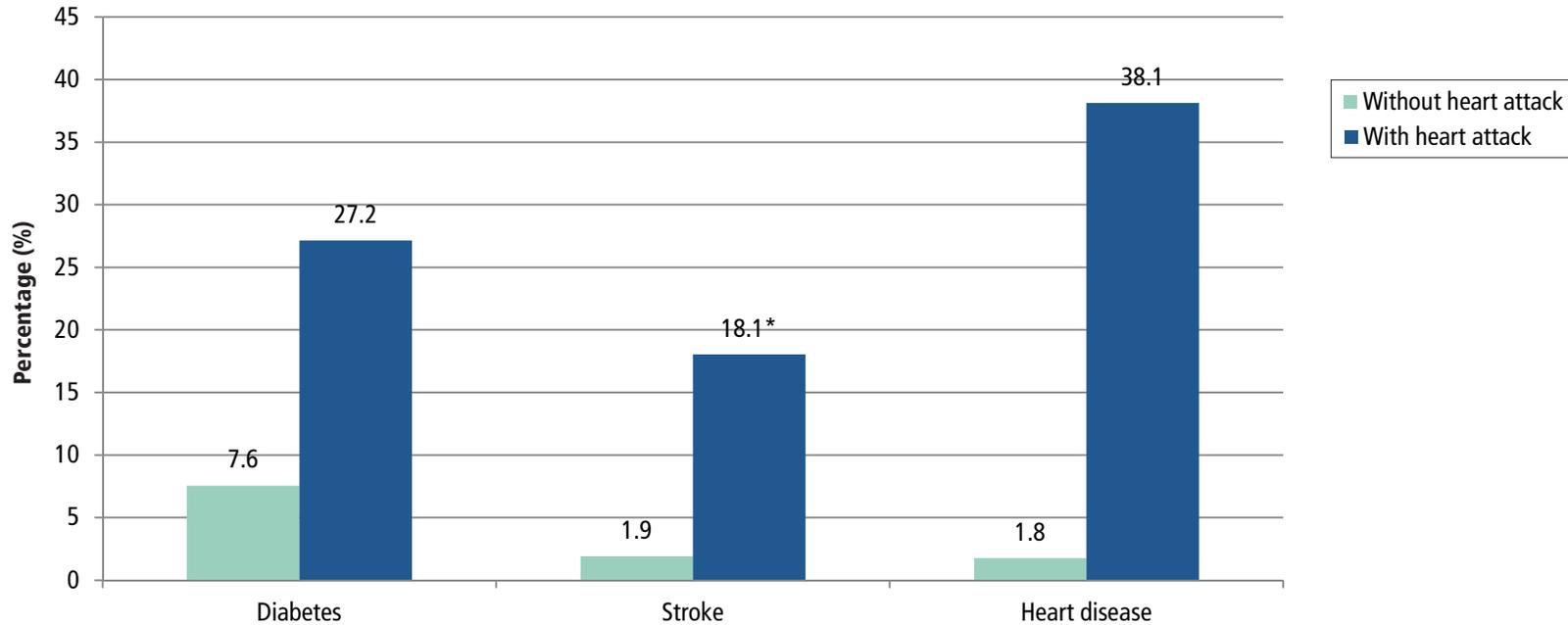
**Note:** Estimates are age-adjusted.

As shown, of adults without heart disease, 7.6% also had diabetes; of adults with heart disease, 48.2% also had diabetes.

- ▶ Of Oregon adults with heart disease, nearly half reported being diagnosed with diabetes, one-in-three had ever had a stroke and three-in-five had ever had a heart attack (Figure 4.2.3).

- ▶ Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have had a stroke and 33 times more likely to have had a heart attack compared to those who did not have heart disease (Figure 4.2.3).

FIGURE 4.2.4 SELECTED CHRONIC DISEASES AMONG ADULTS WHO HAD EVER HAD A HEART ATTACK, OREGON, 2011



**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted. \*This number may be statistically unreliable and should be interpreted with caution.

- ▶ Of Oregon adults who had ever had a heart attack, more than one-in-four had been diagnosed with diabetes, nearly one-in-five had ever had a stroke and more than one-in-three had been diagnosed with heart disease (Figure 4.2.4).
- ▶ Oregon adults who had ever had a heart attack were more than three times as likely to have diabetes and more than 21 times as likely to have heart disease as those who had not had a heart attack (Figure 4.2.4).

## Conclusions

Overall, Oregon adults who reported heart disease and having had a heart attack also reported chronic disease risk factors and co-morbid chronic conditions at a higher rate than those who do not have heart disease and heart attack. Adults with heart disease and heart attack were more likely to be obese, have high blood pressure and high cholesterol and be physically inactive than those without heart disease or those who had ever had a heart attack. Adults with heart disease are three times as likely to have high blood pressure and twice as likely to have high cholesterol as those without heart disease. High blood pressure and high cholesterol, along with smoking cigarettes and lack of physical activity, are key contributors to having a first heart attack and increase the likelihood of having another heart attack if not properly controlled. Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have a stroke and 33 times more likely to have a heart attack compared to those who did not have heart disease.





## 4.3 Prevention and management of heart disease and heart attack

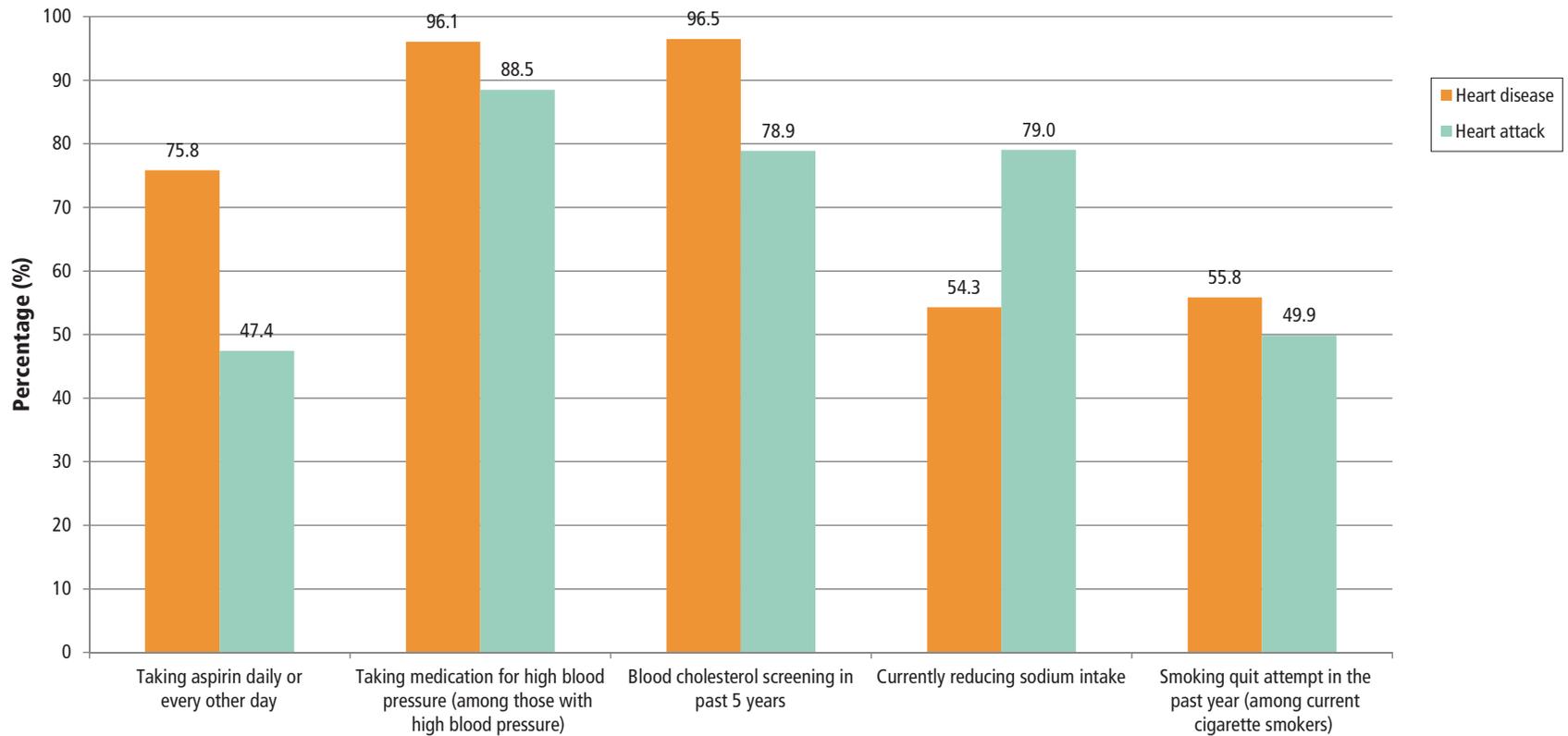
Heart disease and heart attack can be prevented and managed by living a healthy lifestyle and managing other chronic diseases.<sup>4</sup> A healthy lifestyle includes eating a diet high in fruits and vegetables and low in salt and trans fats, being active, maintaining a healthy weight and not cigarette smoking. Individuals with high cholesterol, high blood pressure or diabetes can lower risk for heart disease and heart attack by having cholesterol checked, monitoring blood pressure, managing diabetes, and taking prescribed medicine for control of these conditions.<sup>4</sup>

Management of diabetes includes taking insulin or other medications to manage blood glucose levels and regularly receiving blood glucose (A1C) tests to monitor blood glucose levels. Many heart attack survivors may also require cardiac rehabilitation to reduce the risk of another heart attack or related conditions such as stroke and kidney disease. Cardiac rehabilitation is a program that helps heart attack survivors make lifestyle changes to improve heart health and quality of life through eating a heart-healthy diet high in fresh fruits and vegetables and low in artificial trans fats and sodium, increasing physical activity, stopping cigarette smoking, and managing stress.<sup>3</sup>

Oregon is committed to preventing heart disease and heart attack by addressing the “ABCS” — appropriate **A**spirin therapy, **B**lood pressure control, **C**holesterol control, **S**moking cessation and reduced **S**odium consumption. This section will describe the proportion of Oregon adults with heart disease and heart attack who practice behaviors that help manage current heart disease and prevent future heart attack.

- ▶ Three-in-four Oregon adults with heart disease take aspirin daily or every other day and nearly all (96.5%) had a cholesterol screening in the past five years (Figure 4.3.1).
- ▶ Less than half of adults who had ever had a heart attack reported aspirin use daily or every other day, but the majority reported a cholesterol screening in the past five years (78.9%) (Figure 4.3.1).
- ▶ A little more than half (54.3%) of adults with heart disease reported currently reducing their sodium intake, while more than three-in-four adults who had ever had a heart attack were reducing their sodium intake (Figure 4.3.1).

**FIGURE 4.3.1 SELECTED HEART DISEASE PREVENTION AND MANAGEMENT BEHAVIORS AMONG ADULTS WITH HEART DISEASE OR A HISTORY OF HEART ATTACK, OREGON, 2011**

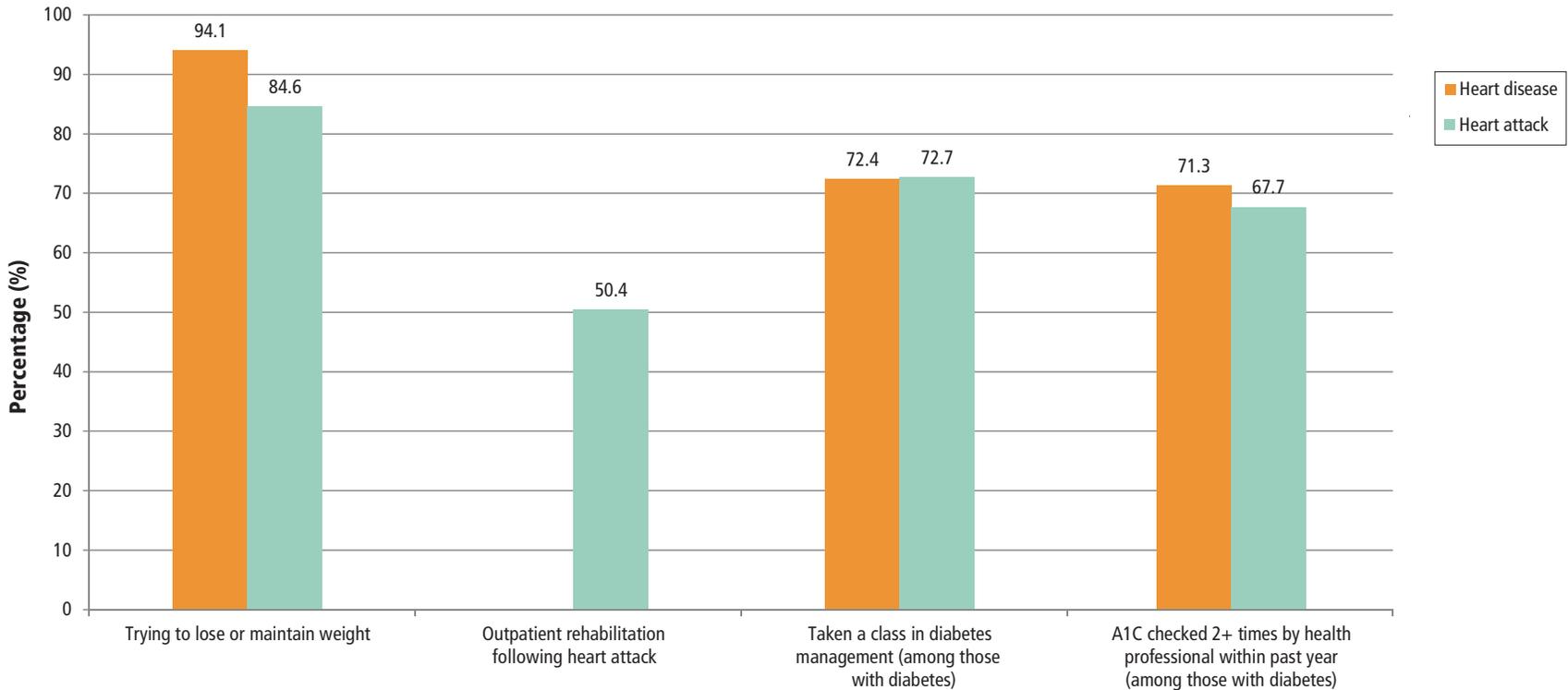


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted.

- ▶ The vast majority of Oregon adults with heart disease (96.1%) and heart attack (88.5%) who also had a diagnosis of high blood pressure were taking medication for their high blood pressure (Figure 4.3.1).
- ▶ Among adults with heart disease and heart attack who were current cigarette smokers, 55.8% and 49.9% had made a quit attempt in the past year (Figure 4.3.1). A similar proportion of current cigarette smokers without heart disease or heart attack reported a quit attempt in the previous year (51.9%).

**FIGURE 4.3.2 SELECTED HEART DISEASE PREVENTION AND MANAGEMENT BEHAVIORS AMONG ADULTS WITH HEART DISEASE OR WHO HAD EVER HAD A HEART ATTACK, OREGON, 2011**



**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted.

- ▶ The vast majority of adults who have heart disease (94.1%) or had ever had a heart attack (84.6%) were trying to lose or maintain weight (Figure 4.3.2). This was higher than the general population of Oregon adults without heart disease or heart attack (80.4%).
- ▶ Among adults who had ever had a heart attack, 50.4% received outpatient rehabilitation following the heart attack (Figure 4.3.2).
- ▶ Among adults with heart disease and a diagnosis of diabetes, nearly three-in-four had taken a class in diabetes management and had their A1C checked two or more times by a health professional within the past year (Figure 4.3.2).
- ▶ Of adults who had ever had a heart attack and also diabetes, 72.7% had taken a class in diabetes management and 67.7% had their A1C checked two or more times by a health professional within the past year (Figure 4.3.2).

## Conclusions

Encouragingly, many Oregon adults who reported heart disease or having had a heart attack are taking steps to prevent an initial or recurring heart attack. The vast majority of both adults with heart disease and those with a heart attack met recommendations for cholesterol screening, were taking doctor-prescribed medication for high blood pressure and had taken a class in diabetes self-management if they had diabetes. In addition, Oregon adults with heart disease and heart attack were more likely than those without these chronic conditions to work on weight management. Interestingly, those who had a heart attack were much more likely to be reducing their sodium intake compared to those who reported heart disease; this may indicate increased vigilance regarding high blood pressure control among those who have experienced an acute cardiac event. In contrast, the majority of adults with heart disease were taking daily aspirin, while less than half of those with heart attack were taking aspirin therapy. The reason for this is unknown. A similar proportion of Oregon adults with heart disease and heart attack made quit attempts compared to Oregon adults without heart disease and heart attack. Cigarette smoking increases the likelihood of a future heart attack, so smoking cessation is especially important for this group of Oregon adults with heart disease and previous heart attack. These results point to a continued need to improve sodium reduction among adults with heart disease, aspirin therapy among heart attack survivors who can safely take aspirin and cigarette smoking cessation among both groups to prevent future heart attacks.

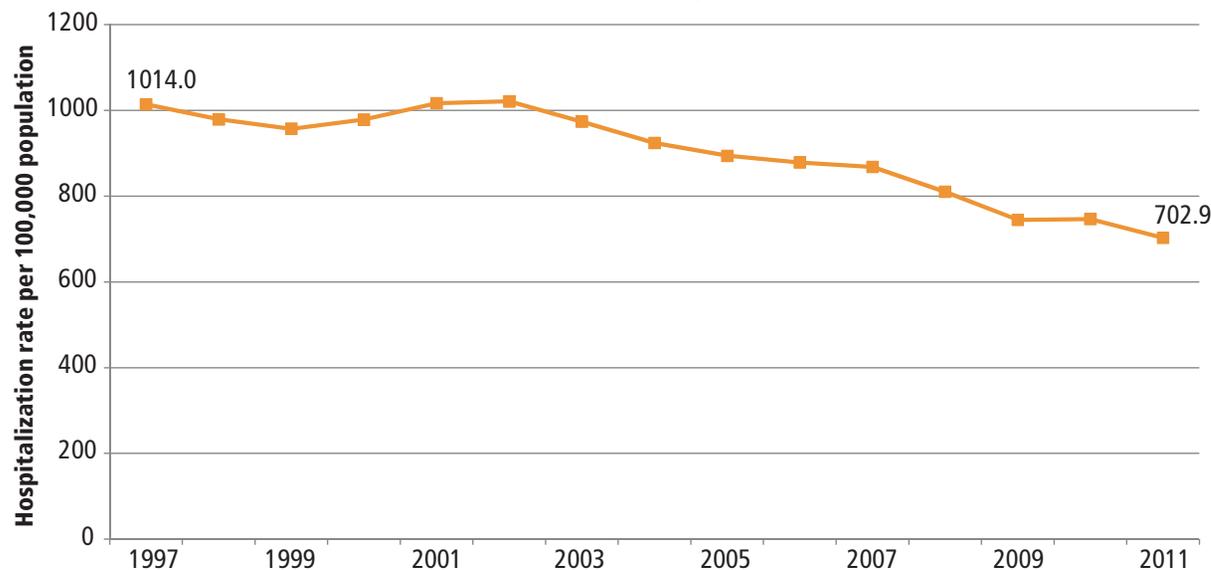


## 4.4 Heart disease and heart attack hospitalizations

Chest pain is among the top five reasons for emergency department (ED) visits in the United States in those aged 15–64 years and heart disease is among the top three reasons for ED visits in those aged 65 years or older.<sup>17</sup> Like ED visits, hospitalizations for heart disease and heart attack are important measures to track chronic and acute cardiac events. Nationally, there were more than 3.7 million hospital discharges for heart disease and 595,000 for heart attack specifically in 2010. This equates to heart disease and heart attack hospitalization rates of 121 per 100,000 U.S. residents

and 19.3 per 100,000 U.S. residents, respectively.<sup>18</sup> The average length of stay for a person hospitalized with a primary diagnosis of heart disease was 4.6 days and 5.4 days for heart attack.<sup>18</sup> Among Oregon residents in 2011, 29,839 were hospitalized with a primary diagnosis of heart disease with heart attack comprising approximately 5,988 (20%) of those hospitalizations. Another 92,501 individuals were hospitalized with heart disease as a non-primary diagnosis or contributing cause. Heart disease accounted for 8.5% of all hospitalizations in Oregon in 2011. The average stay for a person hospitalized with a primary heart disease diagnosis in Oregon was 4.0 days and 3.8 days for heart attack. This section describes heart disease- and heart attack-related hospitalizations in Oregon

**FIGURE 4.4.1 HEART DISEASE HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011**



**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 codes 390–398, 402, 404, 410–429.

over time and by select patient characteristics including gender, age and co-morbid stroke or diabetes.

- ▶ The overall rate of heart disease and heart attack hospitalizations in Oregon decreased since 1997, with year-to-year variation in the numbers (tables 4.4.1 and 4.4.2, figures 4.4.1 and 4.4.2).

- ▶ From 1997 to 2011, the heart disease and heart attack hospitalization rates decreased by 30.7% and 33.6%, respectively (tables 4.4.1 and 4.4.2, figures 4.4.1 and 4.4.2).

**TABLE 4.4.1 HEART DISEASE HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011**

YEAR	HEART DISEASE HOSPITALIZATION RATE
1997	1014.0
1998	979.0
1999	956.9
2000	978.6
2001	1016.6
2002	1020.9
2003	973.6
2004	924.0
2005	894.1
2006	878.3
2007	868.0
2008	809.9
2009	744.3
2010	746.2
2011	702.9

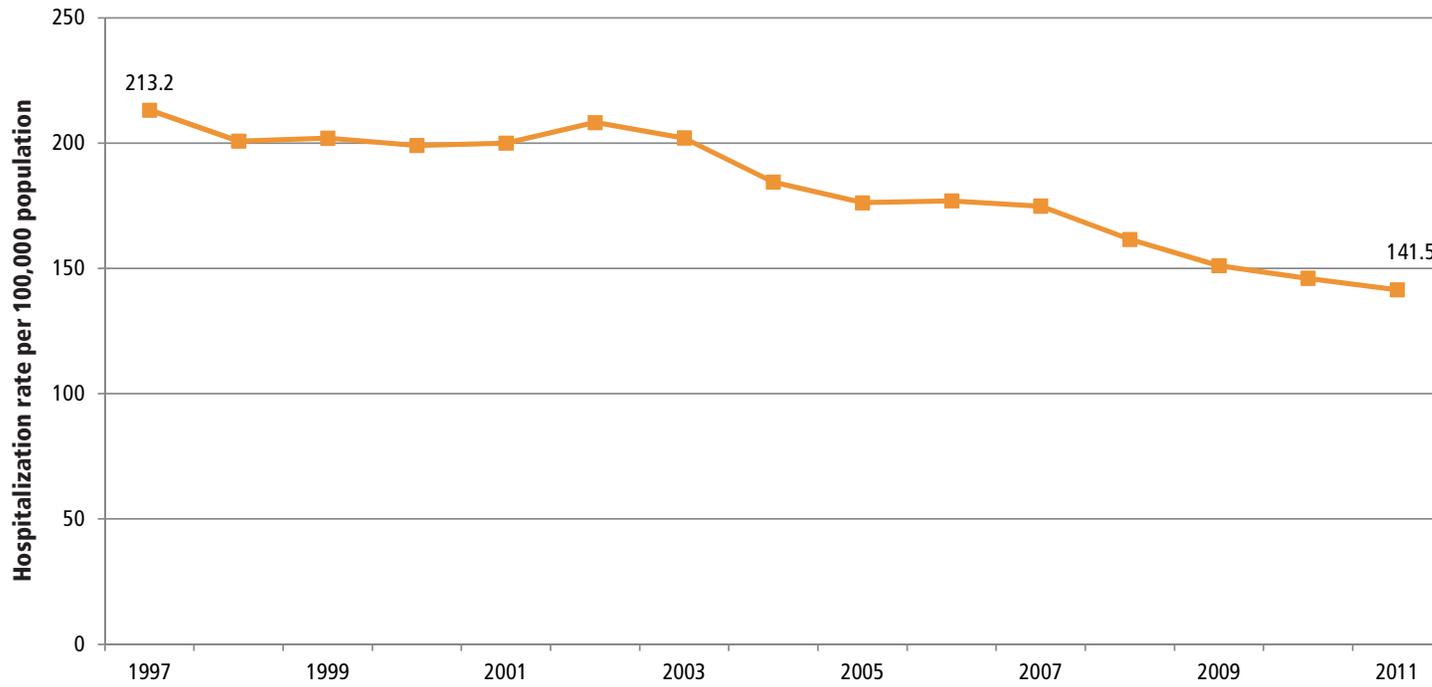
**Data source:** Oregon Hospital Discharge Database  
**Note:** ICD-9 codes 390–398, 402, 404, 410–429

**TABLE 4.4.2 HEART ATTACK HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011**

YEAR	HEART ATTACK HOSPITALIZATION RATE
1997	213.2
1998	200.8
1999	202.0
2000	199.1
2001	200.1
2002	208.3
2003	202.1
2004	184.5
2005	176.3
2006	177.0
2007	174.9
2008	161.5
2009	151.0
2010	146.1
2011	141.5

**Data source:** Oregon Hospital Discharge Database  
**Note:** ICD-9 code 410

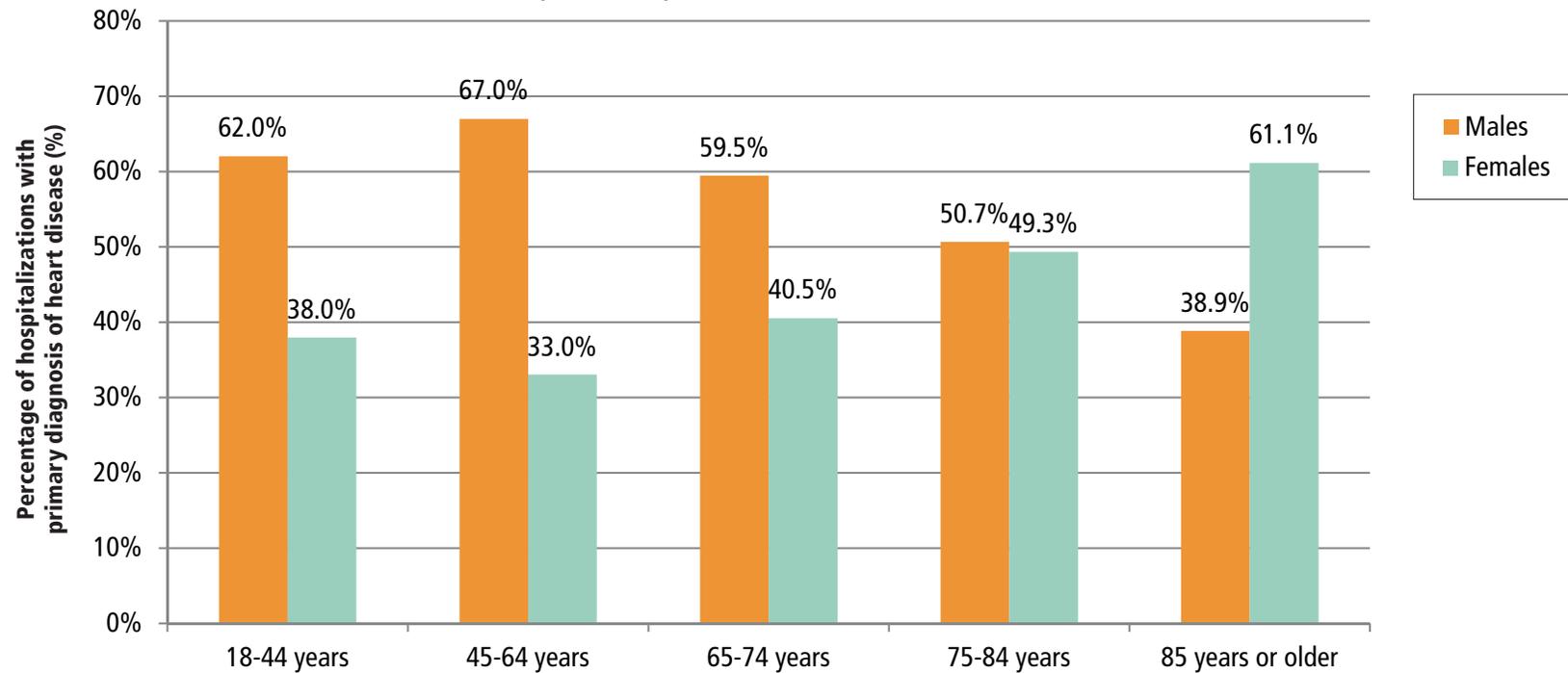
FIGURE 4.4.2 HEART ATTACK HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011



Data source: Oregon Hospital Discharge Database

Note: ICD-9 code 410

**FIGURE 4.4.3 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART DISEASE, BY AGE GROUP AND GENDER, OREGON, 2011**



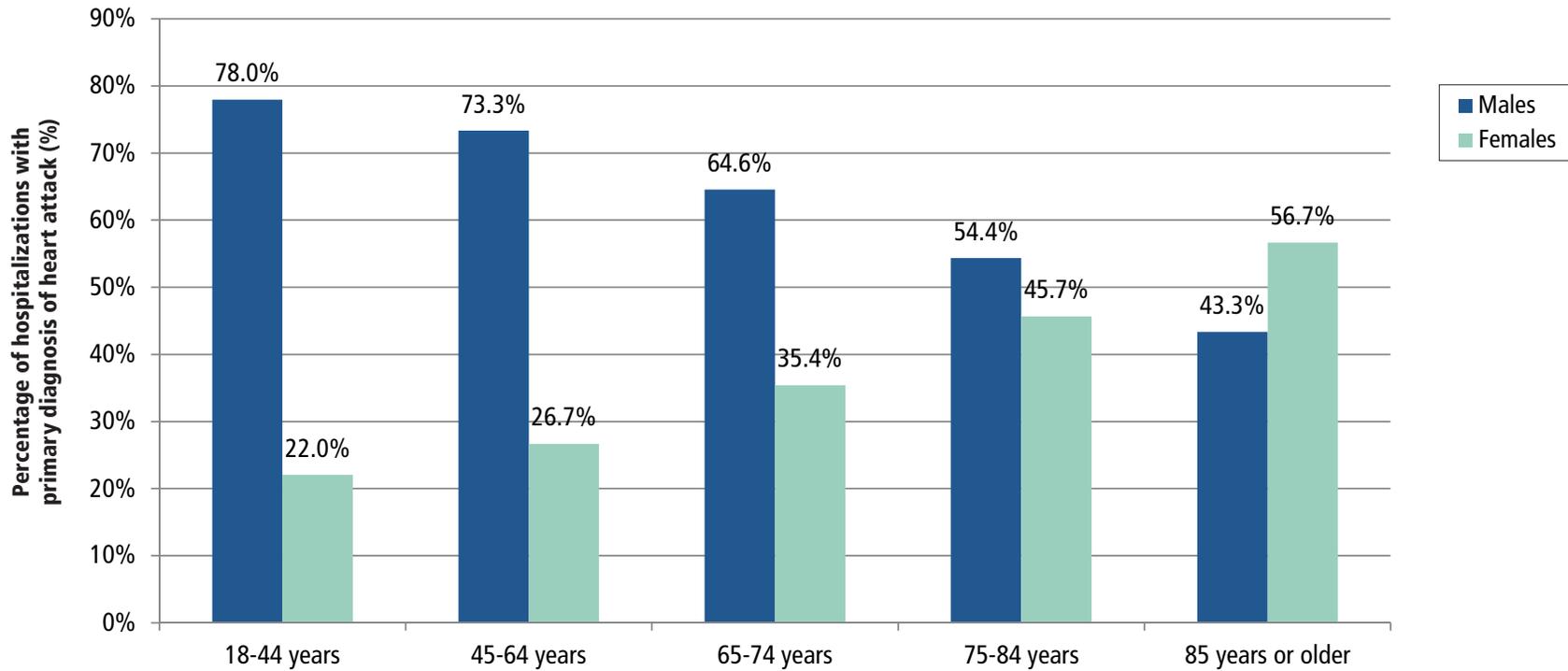
**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 codes 390–398, 402, 404, 410–429

- ▶ The percentage of both heart disease and heart attack hospital discharges among males and females varied substantially by age group.
- ▶ In 2011, in all age groups before the age of 85, men accounted for a higher proportion of heart disease and heart attack hospital discharges, whereas women comprised the majority of hospital discharges in the

85 years or older age group for both heart disease (61.1%) and heart attack (56.7%) (figures 4.4.3 and 4.4.4). This is likely due to the longer life expectancy of females compared to males. This trend was also observed in Oregon hospital discharges due to stroke (see Volume 5: Stroke in Oregon 2013).

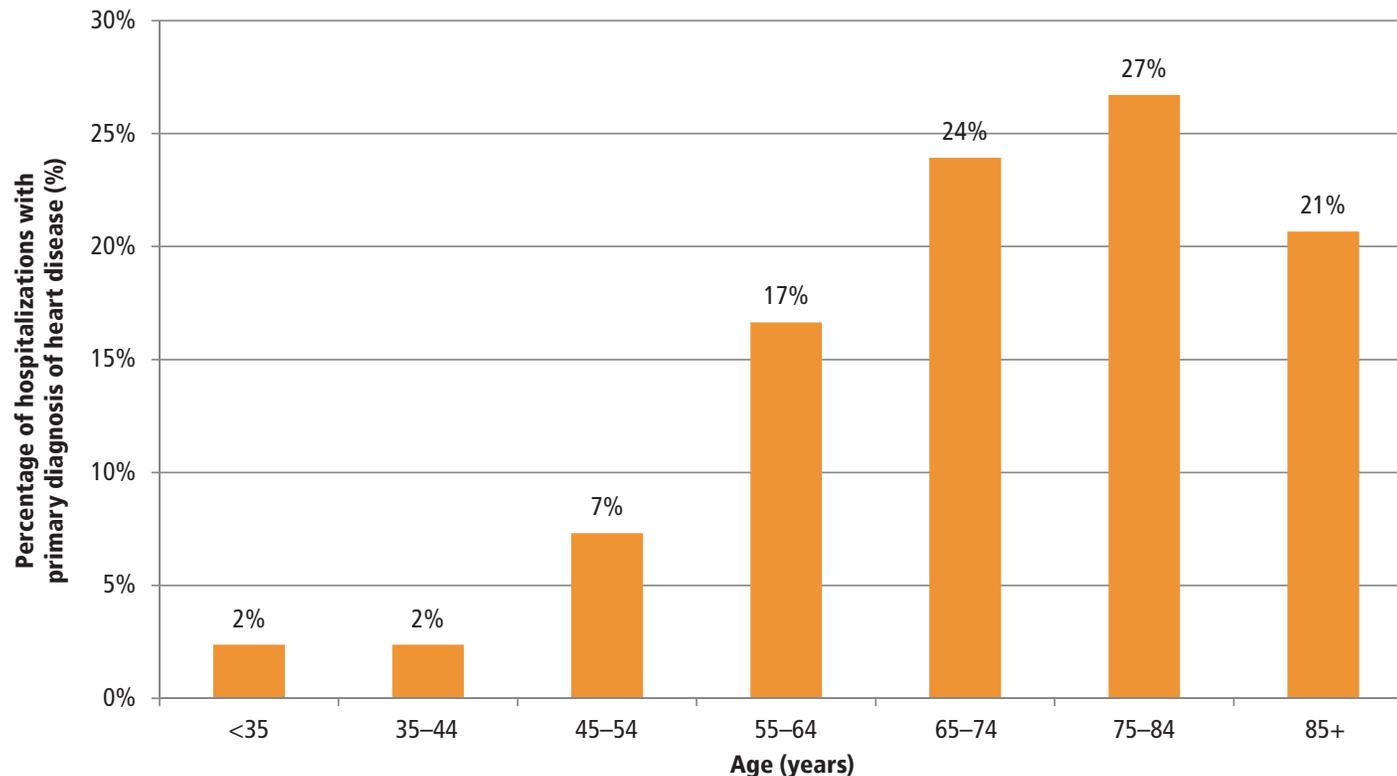
FIGURE 4.4.4 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, BY AGE GROUP AND GENDER, OREGON, 2011



Data source: Oregon Hospital Discharge Database

Note: ICD-9 code 410

**FIGURE 4.4.5 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART DISEASE, BY AGE GROUP, OREGON, 2011**

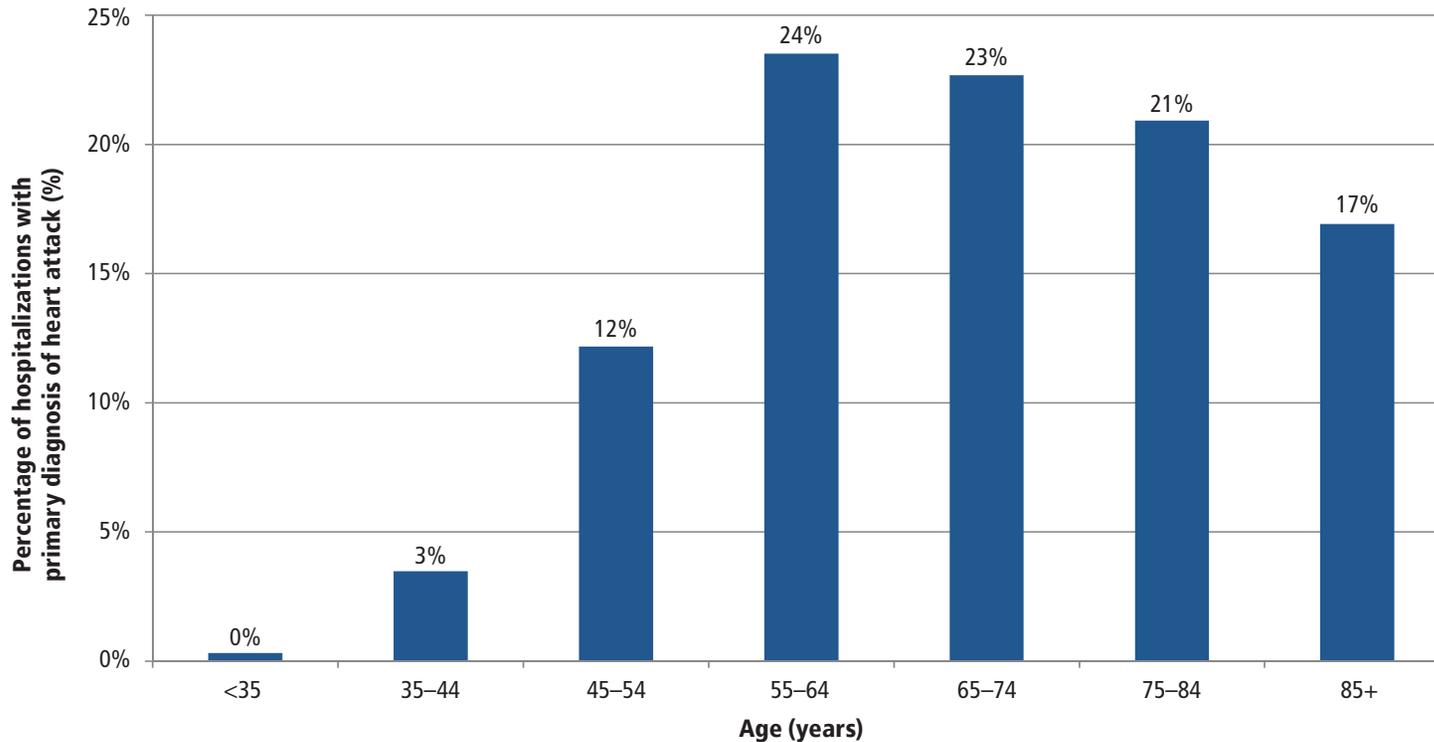


**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 codes 390–398, 402, 404, 410–429.

- ▶ In 2011, 66% of heart disease hospitalizations occurred among people aged 65 years or older (Figure 4.4.5).
- ▶ The average age of a person hospitalized for heart disease in 2011 was 70.2 years.
- ▶ Although the average age of a person hospitalized for heart disease has stayed constant over time in Oregon, the average age for those hospitalized with heart attack has increased by two years since 1997. This could indicate improvements in self-management of heart disease.
- ▶ Although most heart disease and heart attack hospitalizations occur in older Oregonians over the age of 65 years, those under 65 are still susceptible to these conditions and account for approximately one-in-three heart disease and heart attack hospitalizations (figures 4.4.5 and 4.4.6).

FIGURE 4.4.6 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, BY AGE GROUP, OREGON, 2011



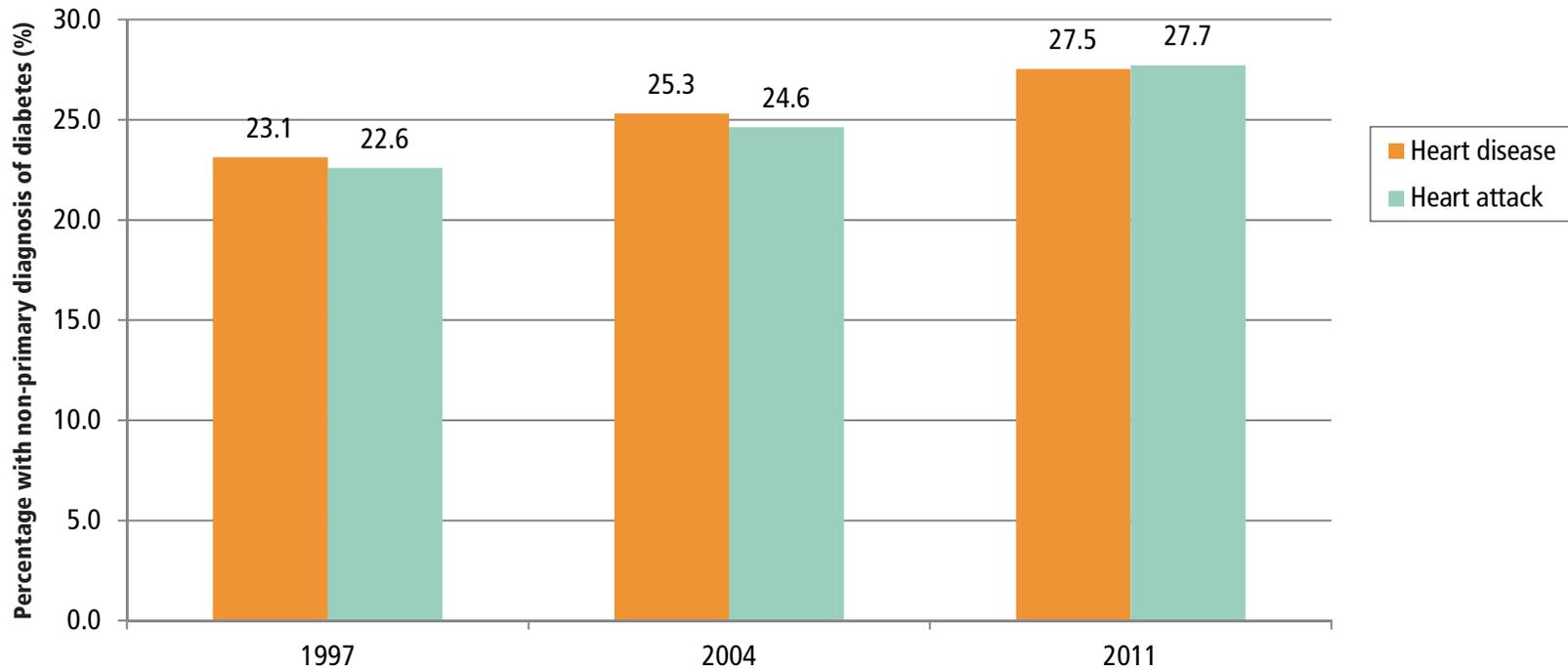
**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** ICD-9 code 410

► In 2011, 61% of heart attack hospitalizations occurred among people aged 65 years or older (Figure 4.4.6).

► The average age of a person hospitalized for a heart attack in 2011 was 69.2 years.

FIGURE 4.4.7 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART DISEASE OR HEART ATTACK AND A NON-PRIMARY DIAGNOSIS OF DIABETES OVER TIME, OREGON, 1997–2011

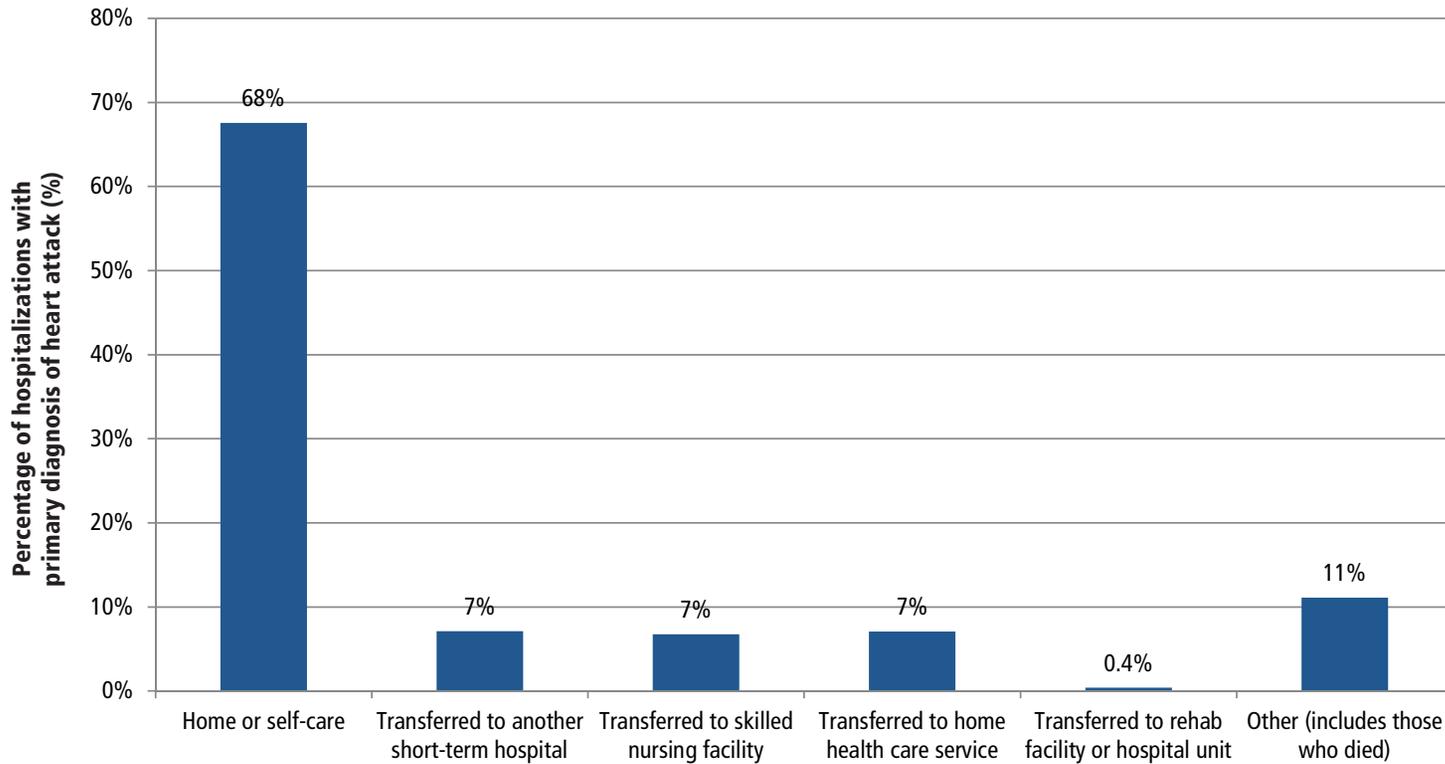


**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 codes 390–398, 402, 404, 410–429 for heart disease and 410 for heart attack

- ▶ In 2011, more than one-quarter of hospitalizations with a primary diagnosis of heart disease or heart attack had diabetes listed as a contributing cause (Figure 4.4.7).
- ▶ From 1997 to 2011, a contributing cause of diabetes increased 19% among hospitalizations due to heart disease and 22.7% among hospitalizations due to heart attack (Figure 4.4.7).

FIGURE 4.4.8 DISCHARGE STATUS OF HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, OREGON, 2011



**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 code 410

- ▶ In 2011, nearly two-in-three (68%) heart attack hospitalizations resulted in a discharge to home or self-care (Figure 4.4.8).

## Conclusions

The rates of heart disease and heart attack hospitalizations in both Oregon and the nation have steadily decreased over time. The majority of heart disease and heart attack hospitalizations occur among people aged 65 years or older, but those under the age of 65 are susceptible to these two conditions and accounted for about one-in-three heart disease and heart attack hospitalizations in 2011. Although men account for a higher proportion of heart disease and heart attack hospitalizations overall, women comprise the majority of these hospitalizations in those aged 85 years or older, which is likely due to the longer life expectancy of females compared to males.



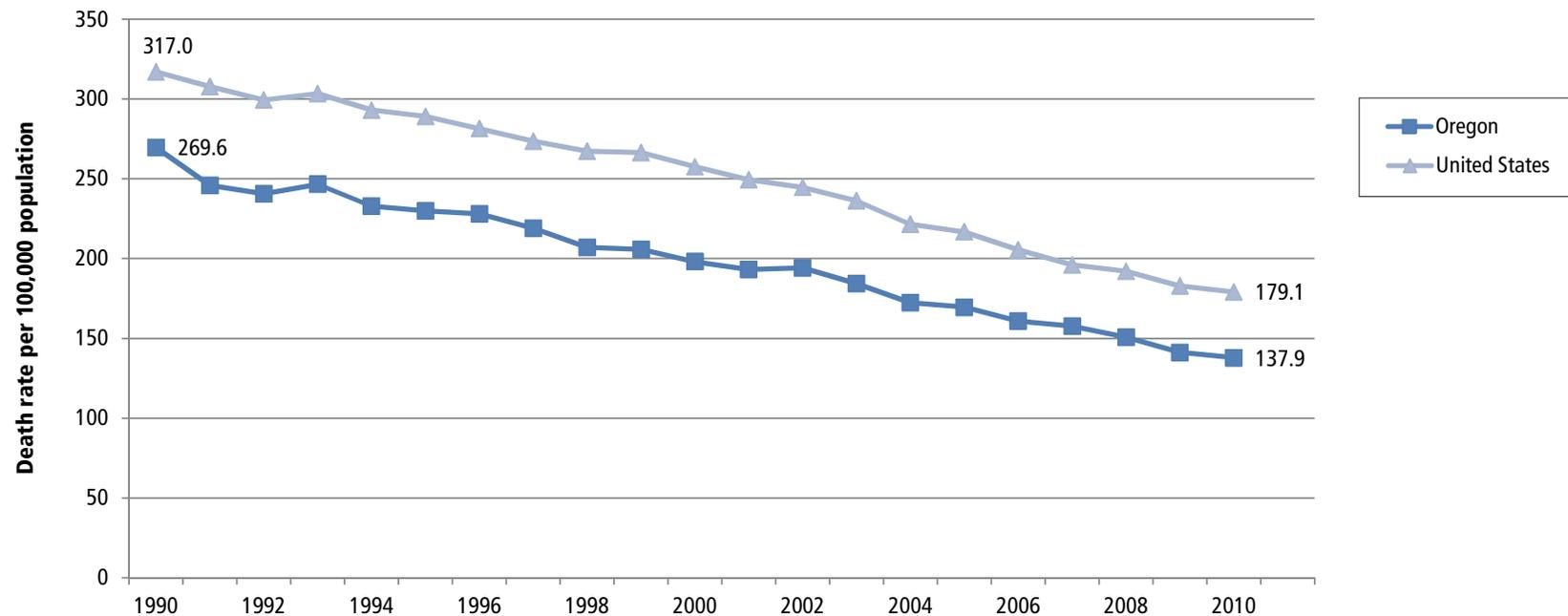
## 4.5 Heart disease and heart attack mortality

Heart disease and heart attack can be prevented or managed by eating a healthy diet, maintaining a healthy weight, being physically active, not smoking cigarettes, and preventing or managing high blood pressure, high cholesterol and diabetes.<sup>4</sup> Unfortunately, heart disease is the second leading cause of death in Oregon and the leading cause of death nationally.<sup>19</sup> In 2009, heart disease accounted for one of every four deaths

in the United States, killing more than 385,000 Americans.<sup>19</sup> In 2011, heart disease was the primary cause of death for 6,215 Oregonians, accounting for 19% of all deaths among Oregon residents. This section will describe deaths from heart disease and heart attack among the Oregon population.

- ▶ From 1990 to 2010, both heart disease and heart attack death rates in Oregon were consistently lower than national rates. In recent years, the difference between Oregon and the United States has lessened (figures 4.5.1 and 4.5.2, tables 4.5.1 and 4.5.2).

**FIGURE 4.5.1 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES, 1990–2010**



**Data source:** Centers for Disease Control and Prevention (CDC) WONDER data system

**Note:** Estimates are age-adjusted. Death rates reflect heart disease as the primary cause of death.

**TABLE 4.5.1 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES, 1990–2010**

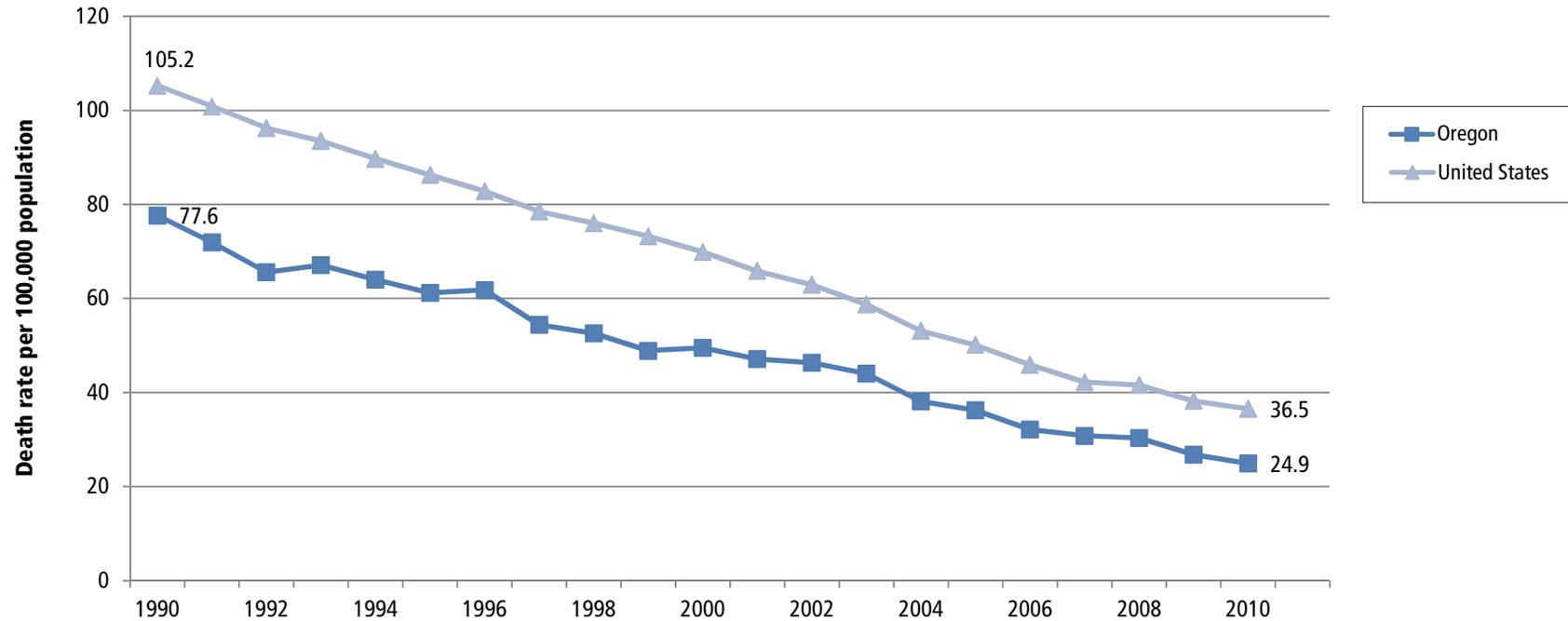
<b>YEAR</b>	<b>OREGON HEART DISEASE DEATH RATE</b>	<b>U.S. HEART DISEASE DEATH RATE</b>
1990	269.6	317.0
1991	245.9	307.9
1992	240.6	299.5
1993	246.6	303.5
1994	232.9	293.1
1995	229.8	289.1
1996	228.1	281.5
1997	218.9	273.6
1998	207.0	267.3
1999	205.7	266.4
2000	198.1	--
2001	193.2	249.5
2002	194.2	244.7
2003	184.4	236.3
2004	172.4	221.6
2005	169.6	216.8
2006	160.9	205.5
2007	157.6	196.1
2008	150.8	192.1
2009	141.2	182.8
2010	137.9	179.1

- ▶ Since 1990, the rate of death due to heart disease in Oregon decreased 48.4% (Figure 4.5.1 and Table 4.5.1).
- ▶ The larger relative decrease in heart attack death rates compared to heart disease death rates may reflect improved clinical care and emergency medical services.
- ▶ From 1990 to 2010, the national rate of death due to heart disease decreased 43.5% (Figure 4.5.1 and Table 4.5.1).

**Data source:** Centers for Disease Control and Prevention (CDC) Wonder data system

**Note:** Estimates are age-adjusted. Death rates reflect heart disease as the primary cause of death.

FIGURE 4.5.2 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES, 1990–2010



**Data source:** Centers for Disease Control and Prevention (CDC) Wonder data system

**Note:** Estimates are age-adjusted. Death rates reflect heart attack as the primary cause of death.

- ▶ From 1990 to 2010, the national rate of death due to heart attack decreased 65.3% (Figure 4.5.2 and Table 4.5.2).

**TABLE 4.5.2 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES, 1990–2010**

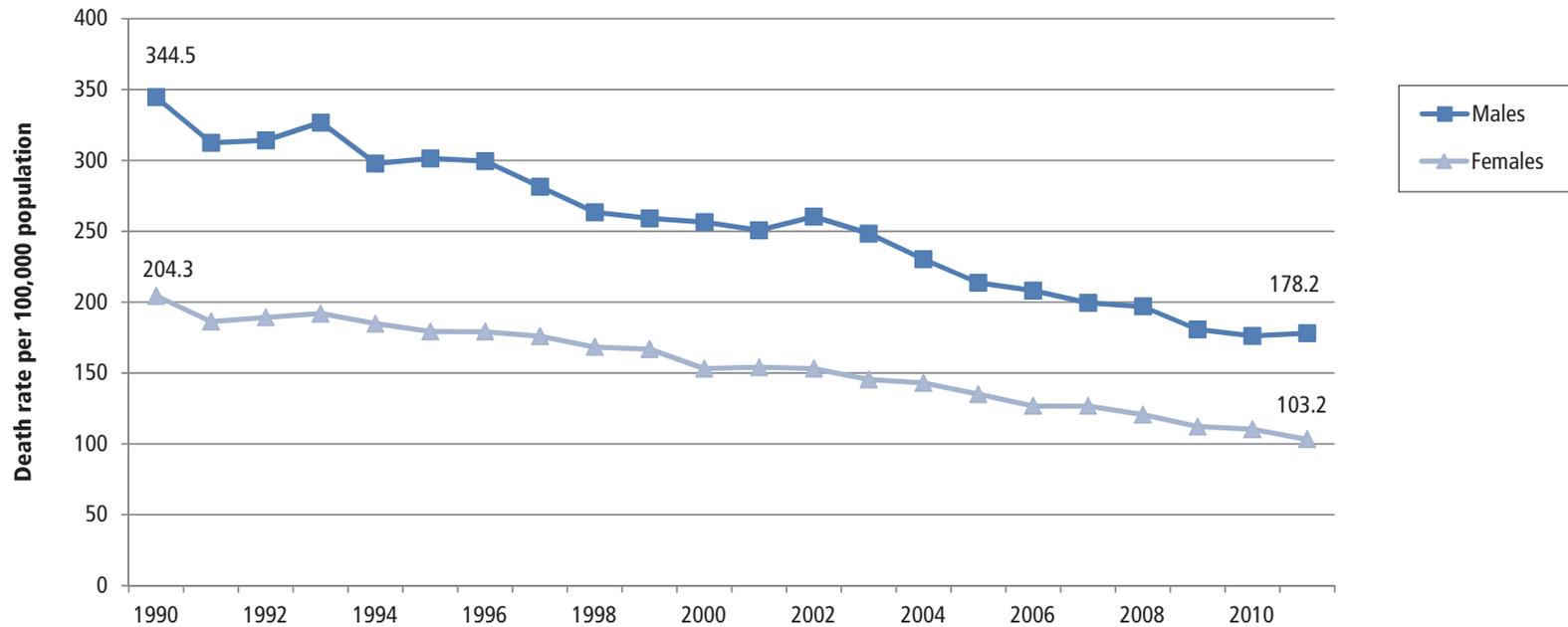
YEAR	OREGON HEART ATTACK DEATH RATE	U.S. HEART ATTACK DEATH RATE
1990	77.6	105.2
1991	71.9	100.8
1992	65.6	96.2
1993	67.1	93.5
1994	64.0	89.7
1995	61.2	86.3
1996	61.8	82.8
1997	54.4	78.5
1998	52.6	76.0
1999	48.9	73.2
2000	49.5	69.9
2001	47.1	65.8
2002	46.3	62.9
2003	44.0	58.7
2004	38.1	53.1
2005	36.2	50.1
2006	32.1	45.9
2007	30.8	42.2
2008	30.3	41.6
2009	26.8	38.2
2010	24.9	36.5

- ▶ Since 1990, the rate of death due to heart attack in Oregon decreased 68.6% (Figure 4.5.2 and Table 4.5.2).



**Data source:** Centers for Disease Control and Prevention (CDC) Wonder data system  
**Note:** Estimates are age-adjusted. Death rates reflect heart attack as the primary cause of death.

**FIGURE 4.5.3 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY GENDER AND YEAR, OREGON, 1990–2011**

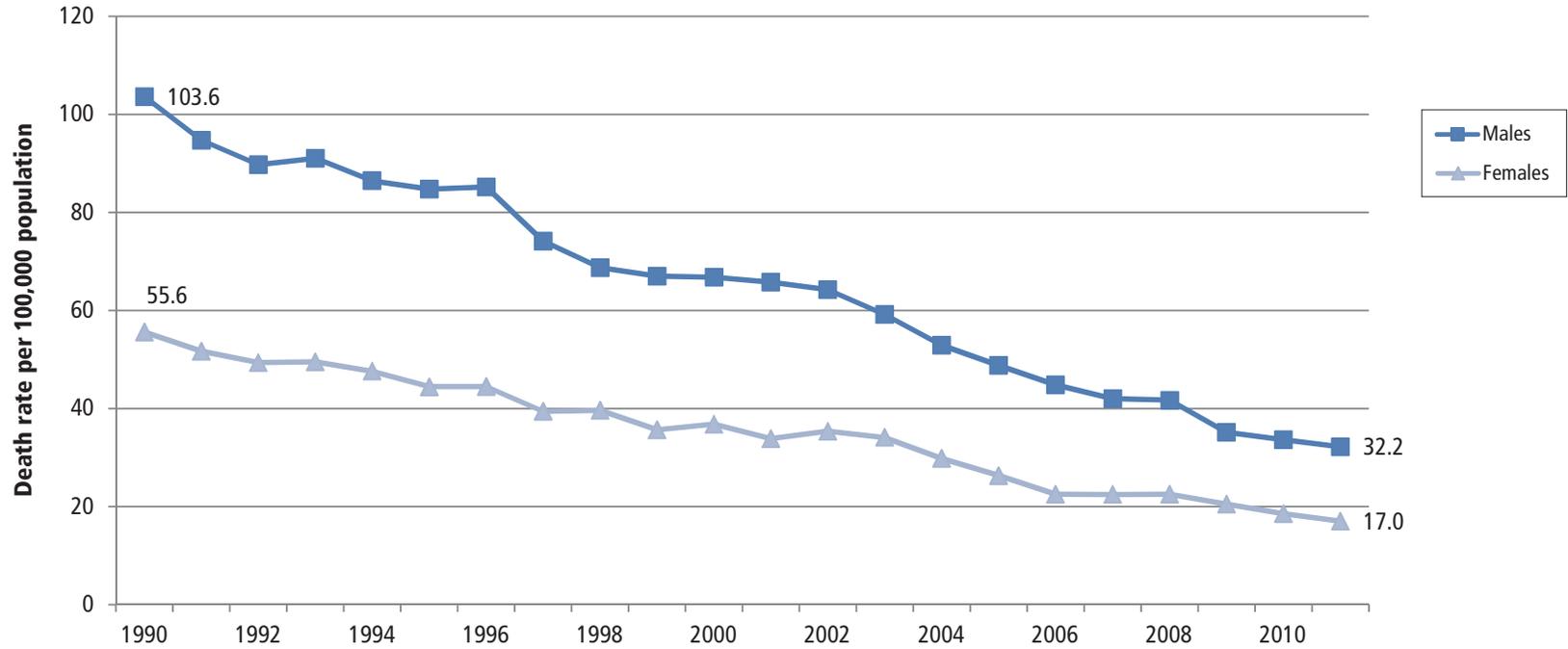


**Data source:** Oregon Death Certificates

**Note:** Death rates reflect heart disease as the primary cause of death.

- ▶ Over time, heart disease and heart attack death rates were higher among men than women (figures 4.5.3 and 4.5.4).
- ▶ However, the difference in heart disease and heart attack death rates between the two genders decreased over time, particularly for heart attack deaths (figures 4.5.3 and 4.5.4).
- ▶ In 2011, 3,360 male and 2,855 female Oregonians died from heart disease. This is a heart disease death rate of 178.2 per 100,000 population for males and 103.2 per 100,000 population for females.

**FIGURE 4.5.4 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY GENDER AND YEAR, OREGON, 1990–2011**

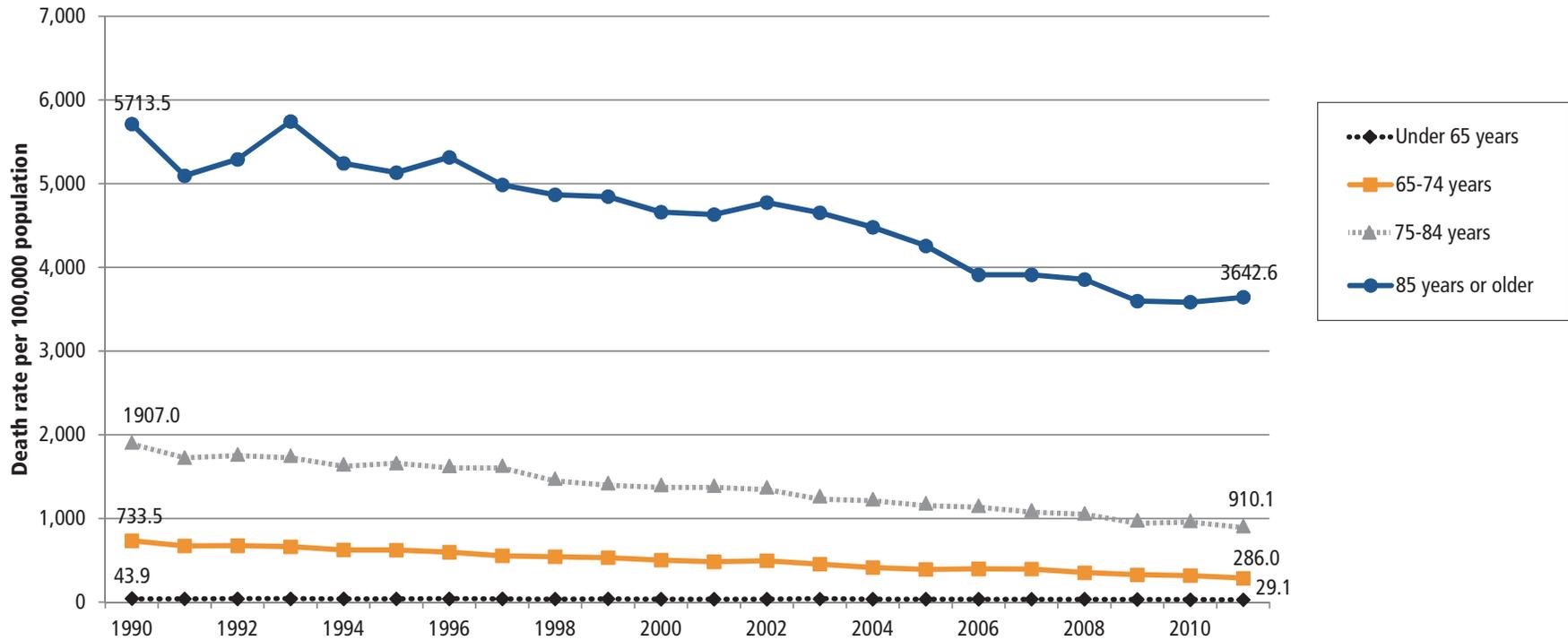


**Data source:** Oregon Death Certificates

**Note:** Death rates reflect heart attack as the primary cause of death.

- ▶ In 2011, 626 male and 452 female Oregonians died from heart attack. This is a heart attack death rate of 32.2 per 100,000 population for males and 17.0 per 100,000 population for females.

**FIGURE 4.5.5 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND YEAR, OREGON, 1990–2011**

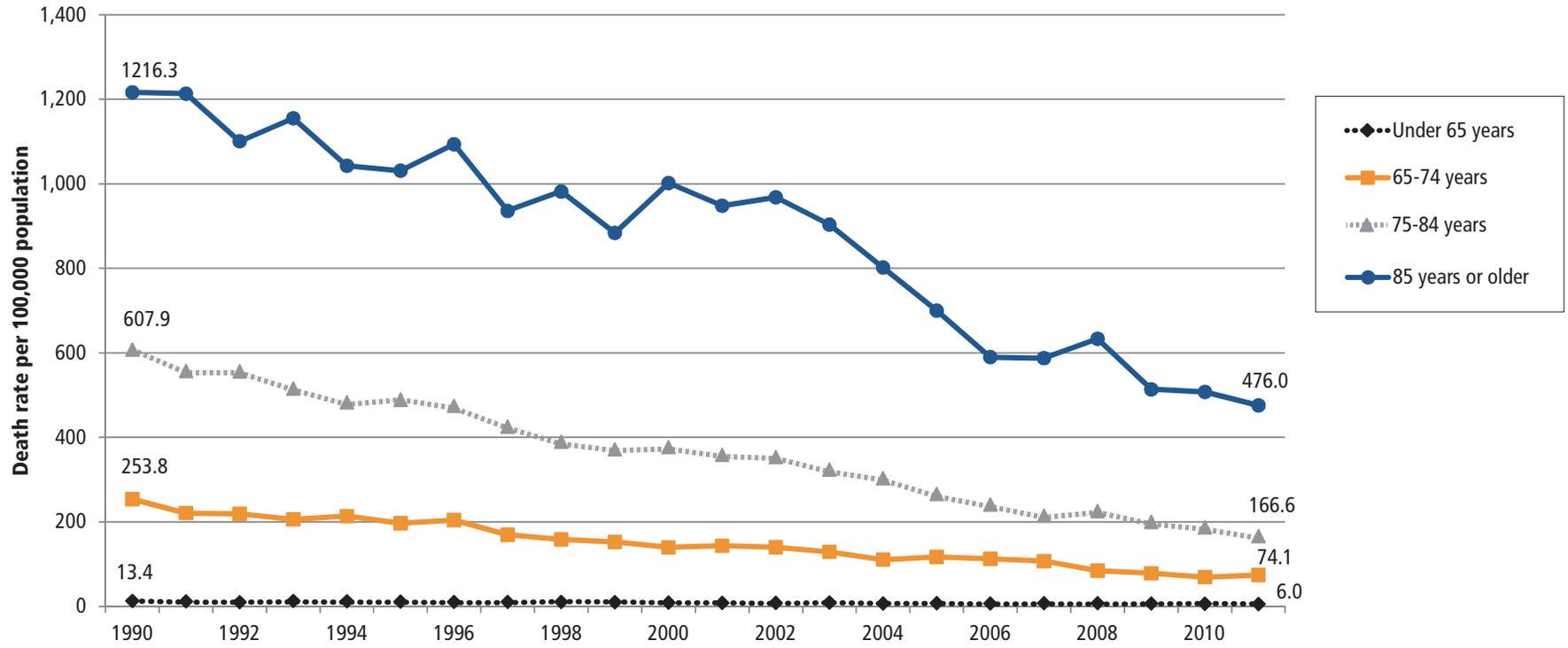


**Data source:** Oregon Death Certificates

**Note:** Death rates reflect heart disease as the primary cause of death.

- ▶ From 1990 to 2011, there was a 33.7% decrease in the heart disease death rate among those aged less than 65 years, a 61.0% decrease in those 65–74 years old, a 52.3% decrease in those 75–84 years old and a 36.2% decrease in those 85 years old or older (Figure 4.5.5).
- ▶ Over time, heart disease and heart attack death rates declined across all age groups in Oregon (figures 4.5.5 and 4.5.6).
- ▶ Heart attack death rates saw a larger relative decline than heart disease death rates across all age groups (figures 4.5.5 and 4.5.6).

**FIGURE 4.5.6 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND YEAR, OREGON, 1990–2011**

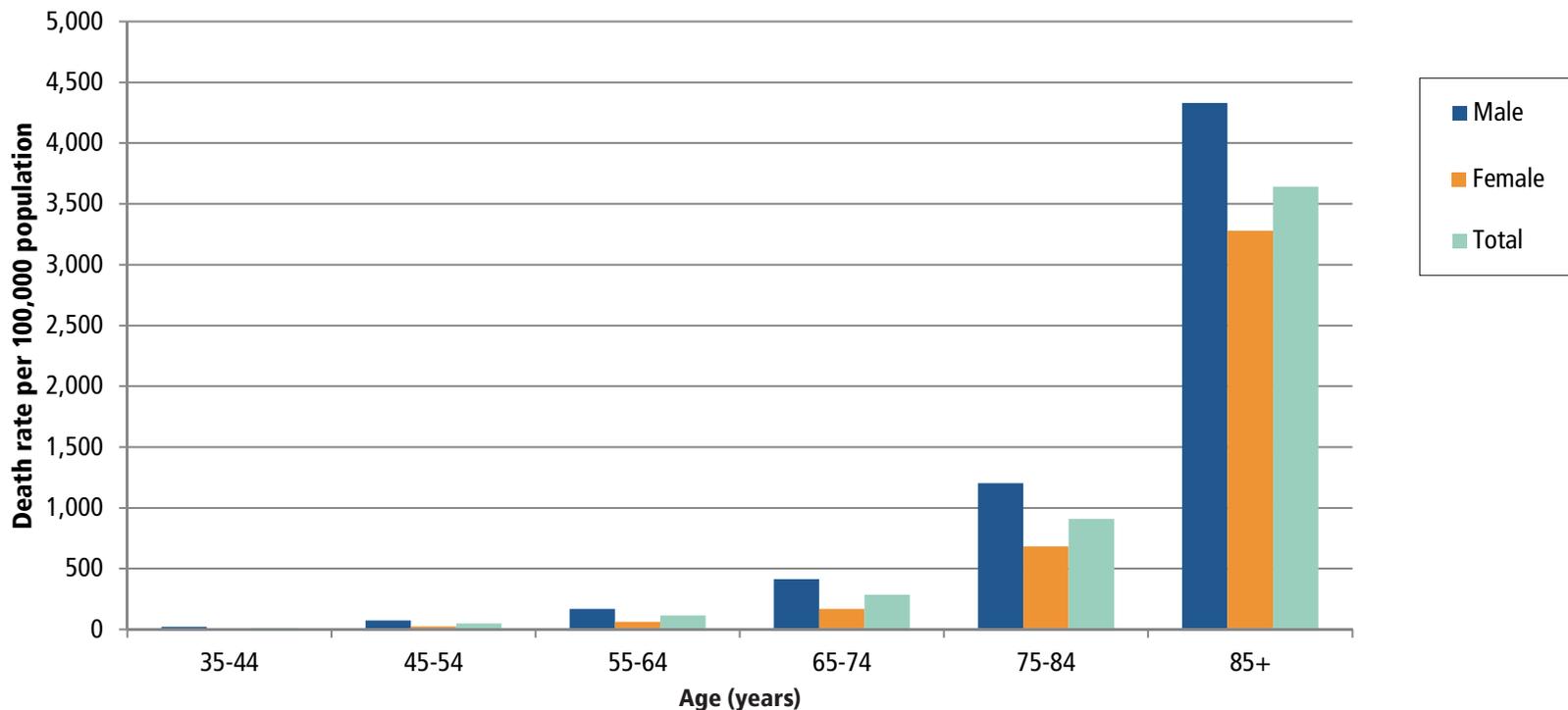


**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are not age-adjusted.

- ▶ From 1990 to 2011, there was a 55.2% decrease in the heart attack death rate among those aged less than 65 years, a 70.8% decrease in those 65–74 years old, a 72.6% decrease in those 75–84 years old and a 60.9% decrease in those 85 years old or older (Figure 4.5.6).

FIGURE 4.5.7 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND GENDER, OREGON, 2011



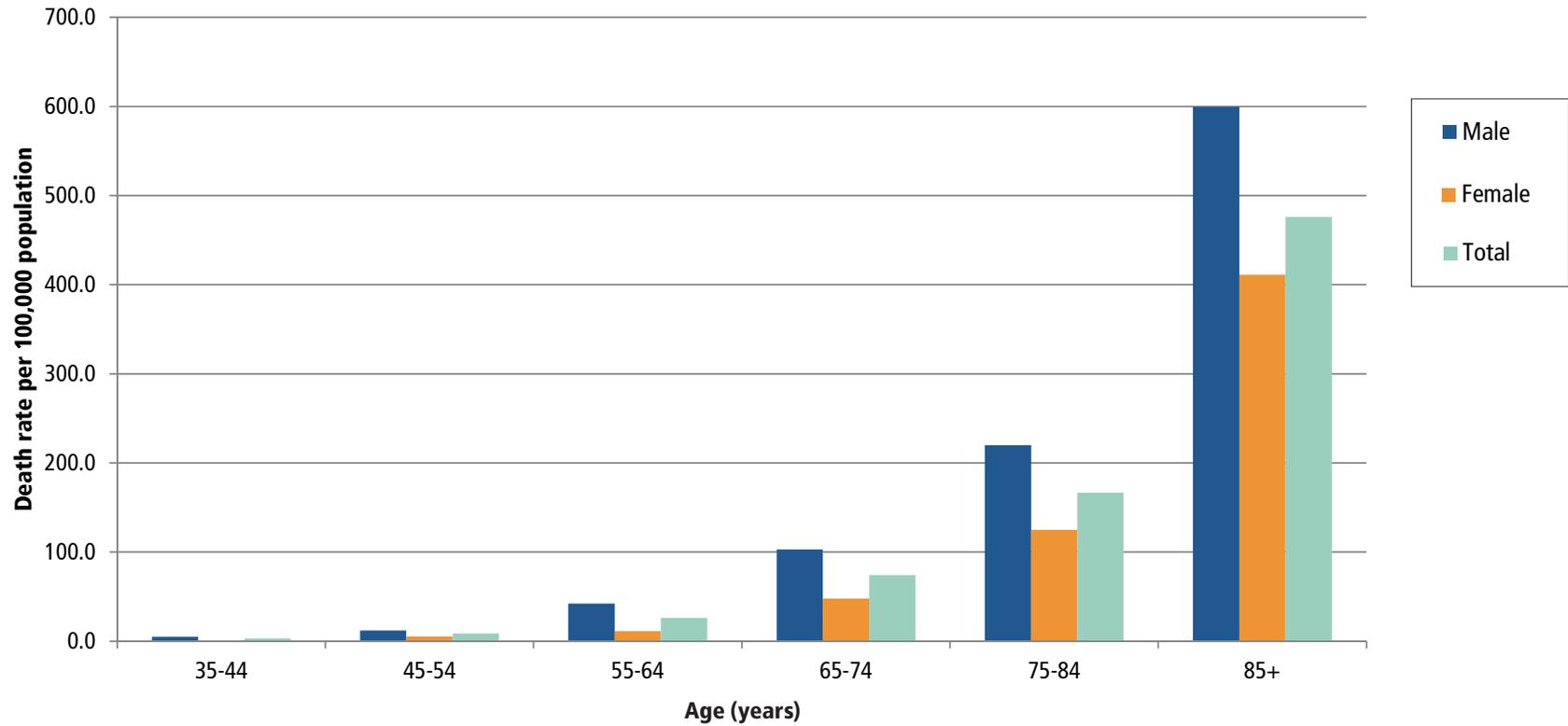
**Data source:** Oregon Death Certificates

**Note:** Death rates reflect heart disease as the primary cause of death.

▶ Heart disease and heart attack death rates were higher in older age groups, and were markedly higher in those aged 75 years old or older (figures 4.5.7 and 4.5.8).

▶ Heart disease and heart attack death rates were higher among men than women in all age groups (figures 4.5.7 and 4.5.8).

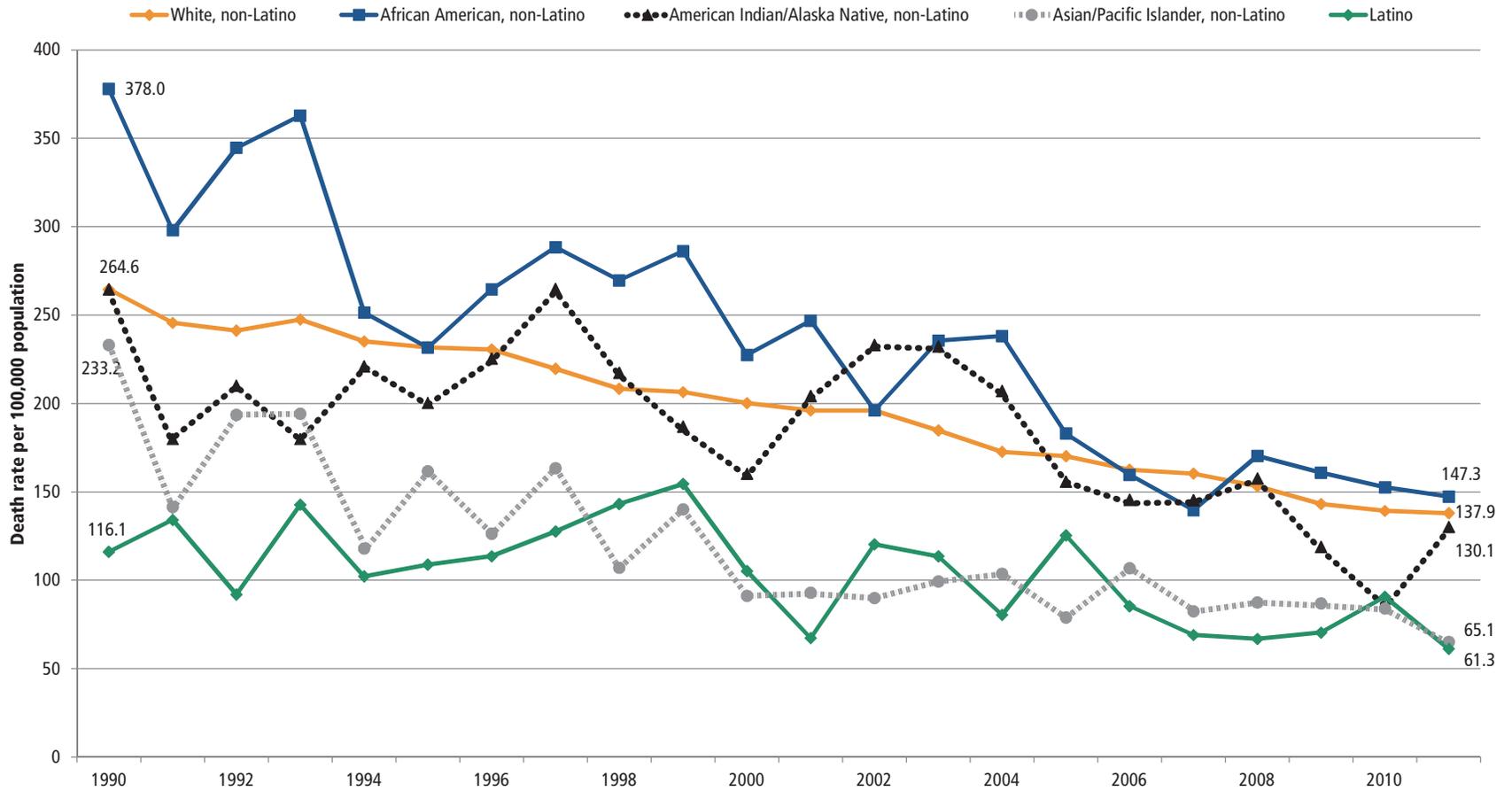
FIGURE 4.5.8 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND GENDER, OREGON, 2011



**Data source:** Oregon Death Certificates

**Note:** Death rates reflect heart attack as the primary cause of death.

**FIGURE 4.5.9 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY RACE AND ETHNICITY, OREGON, 1990–2011**

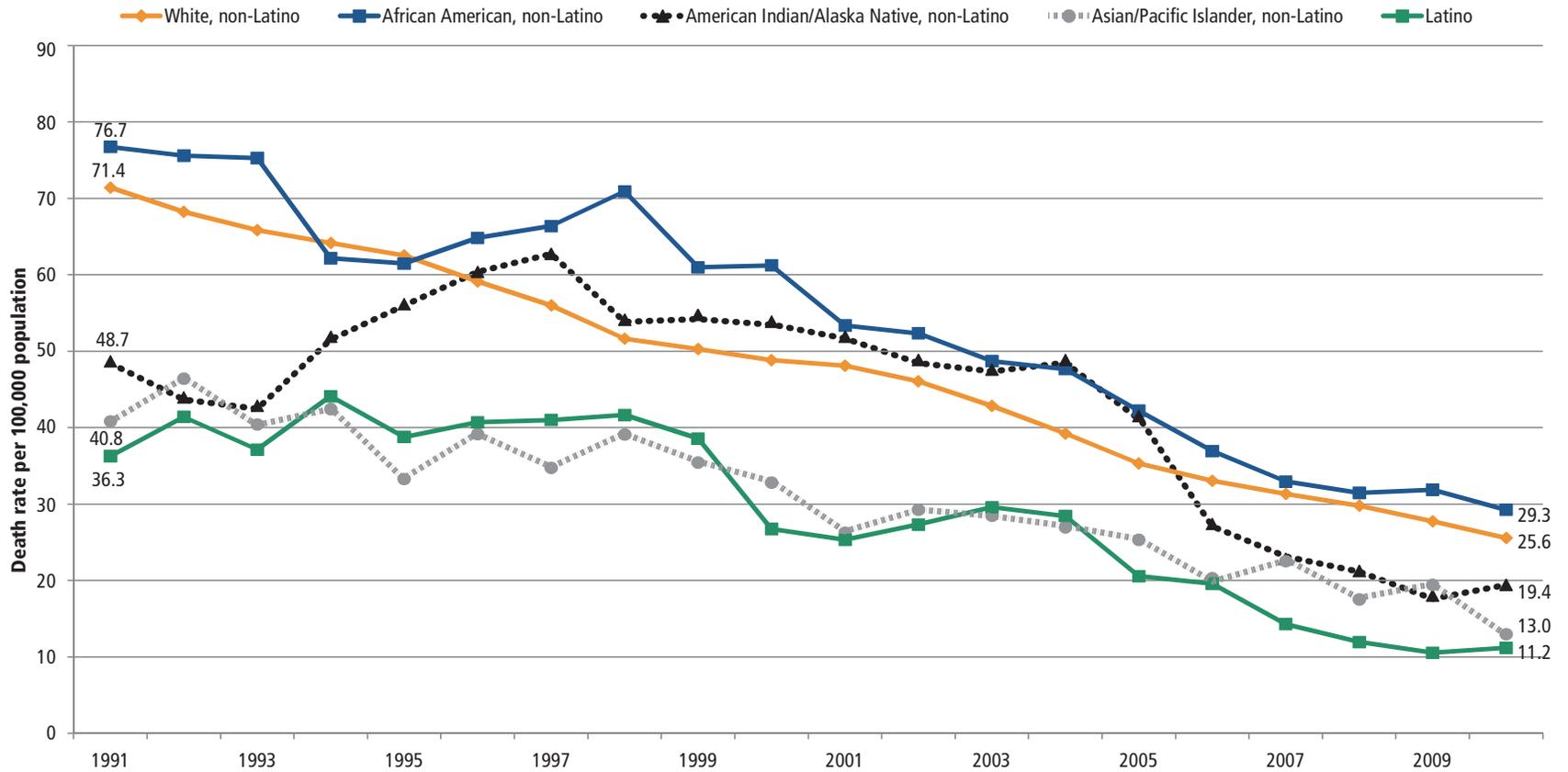


**Data source:** Oregon Death Certificates

**Note:** Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart disease as the primary cause of death.

- ▶ Over time, death rates from heart disease and heart attack decreased for all racial and ethnic groups (figures 4.5.9 and 4.5.10).

**FIGURE 4.5.10 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY RACE AND ETHNICITY, OREGON, 1991–2010**



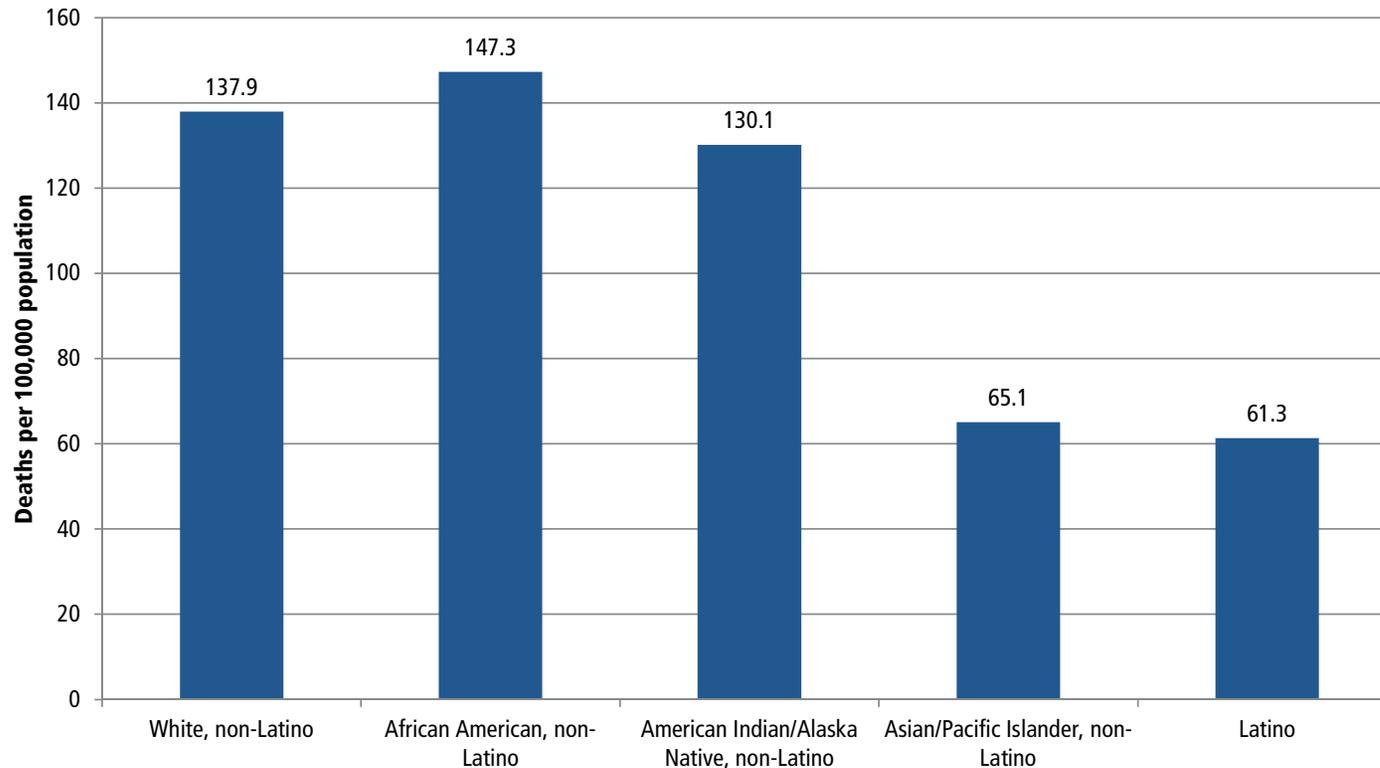
**Data source:** Oregon Death Certificates

**Note:** Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart attack as the primary cause of death.

▶ Although the disparity in heart disease and heart attack death rates among racial and ethnic groups lessened over time, non-Latino African American persons had consistently higher death rates from both heart disease

and heart attack compared to all other racial and ethnic groups (figures 4.5.9 and 4.5.10).

FIGURE 4.5.11 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY RACE AND ETHNICITY, OREGON, 2008–2010

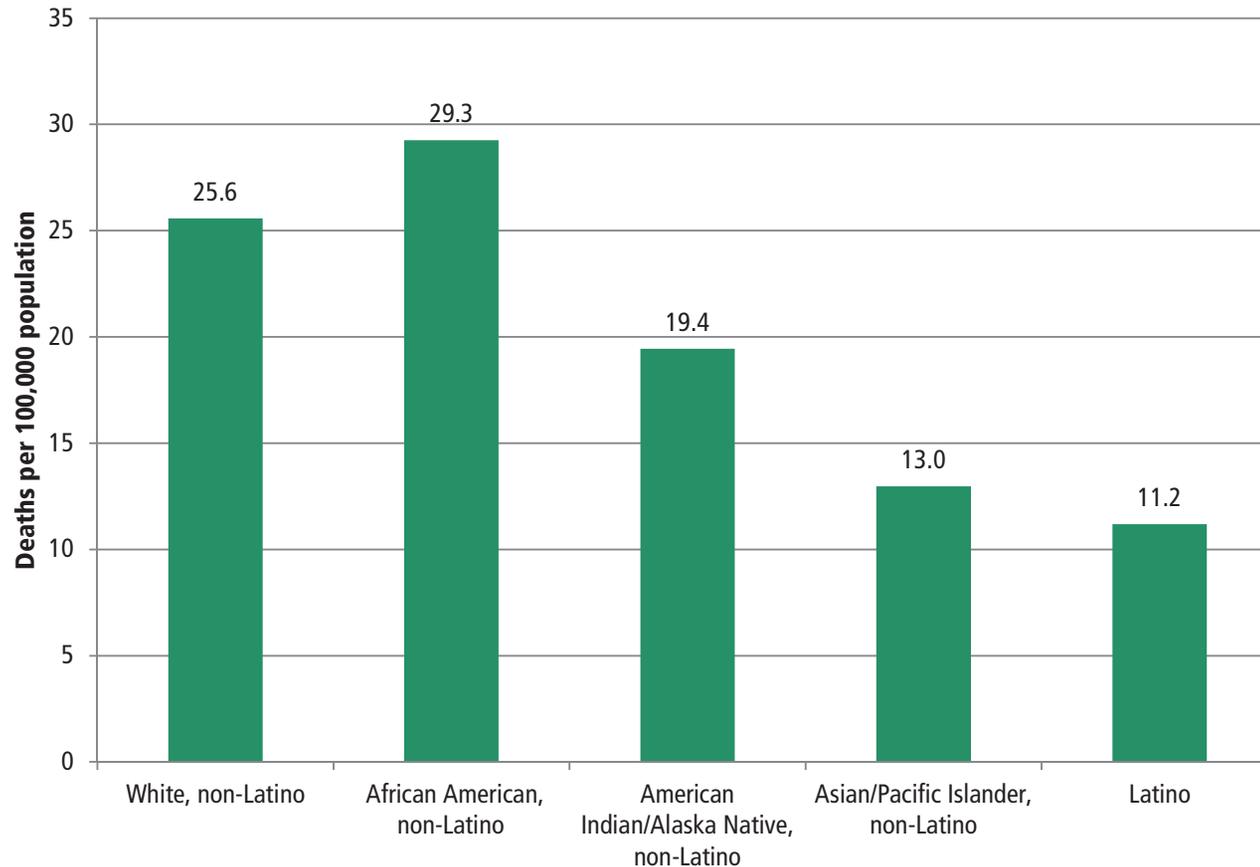


**Data source:** Oregon Death Certificates

**Notes:** Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart disease as the primary cause of death.

- ▶ A higher percentage of the non-Latino African American population in Oregon reported high blood pressure, obesity, diabetes and cigarette smoking than other racial and ethnic groups, which may contribute to this disparity.
- ▶ From 2008–2010, non-Latino African American persons had the highest average death rates from heart disease and heart attack at 147.3 deaths per 100,000 people and 29.3 deaths per 100,000 people, respectively (figures 4.5.11 and 4.5.12).

FIGURE 4.5.12 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY RACE AND ETHNICITY, OREGON, 2008–2010



**Data source:** Oregon Death Certificates

**Notes:** Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart attack as the primary cause of death.

- ▶ Latino people had the lowest average death rates from heart disease and heart attack at 61.3 deaths per 100,000 people and 11.2 deaths per 100,000 people, respectively (figures 4.5.11 and 4.5.12).
- ▶ The African American population had an additional 86 heart disease deaths per 100,000 people and 18.1 heart attack deaths per 100,000 people compared to the Latino population (figures 4.5.11 and 4.5.12).



## Conclusions

Overall, deaths from heart disease and heart attack have been decreasing over time both in Oregon and nationally. Decreases in heart disease and heart attack death were seen among both males and females, and across all age groups and racial and ethnic groups. It is important to note that although all racial and ethnic groups saw decreases in heart attack and heart disease death rates, non-Latino African American persons still experienced a disproportionately high burden of heart disease and heart attack death compared to all other racial and ethnic groups, and this trend has held constant over the last two decades.

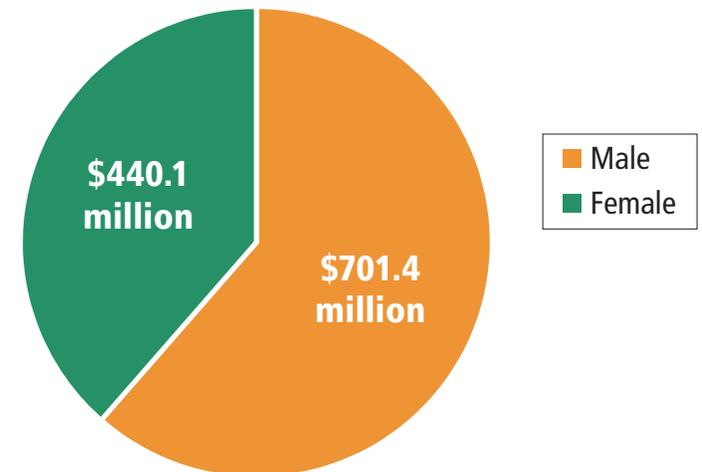


## 4.6 Heart disease and heart attack costs

Heart disease is the second leading cause of death in Oregon and heart attack is a leading cause of serious long-term disability in Oregon and nationally. Every year, approximately 715,000 people in the United States have a heart attack, and about 125,000 of these heart attacks result in death.<sup>20</sup> Chest pain is among the top five reasons for emergency department (ED) visits in the United States in those age 15–64 years and heart disease is among the top three reasons for ED visits in those aged 65 years or older.<sup>17</sup> The cost is high for hospitalization, death and disability associated with heart disease and heart attack. The costs for coronary heart disease alone are \$109 billion every year, which includes the cost of health care services, medication and lost productivity.<sup>21</sup> In Oregon, the average cost of a hospitalization due to heart disease in 2011 was more than \$38,000, with total medical costs exceeding \$1.1 billion. The costs associated with heart disease and heart attack hospitalizations have steadily increased since 1997. In addition to these direct costs, families who experience heart disease and eventual heart attack not only suffer high medical bills, but also indirect costs such as lost wages and a decreased standard of living due to serious illness and disability.

- ▶ In 2011, males accounted for 61% of the total cost of heart disease hospitalizations and females accounted for 39% of the total costs; \$701.4 million and \$440.1 million were spent on heart disease hospitalizations for males and females, respectively (figures 4.6.1 and 4.6.2).

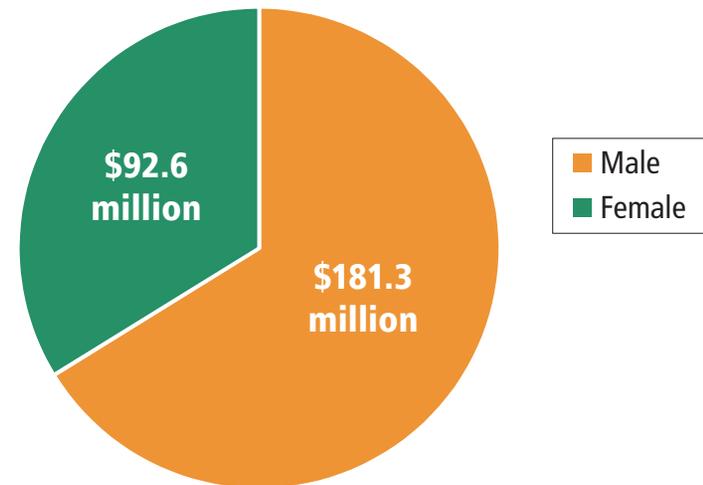
**FIGURE 4.6.1 TOTAL COSTS OF HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART DISEASE, BY GENDER, OREGON, 2011**



**Data source:** Oregon Hospital Discharge Dataset

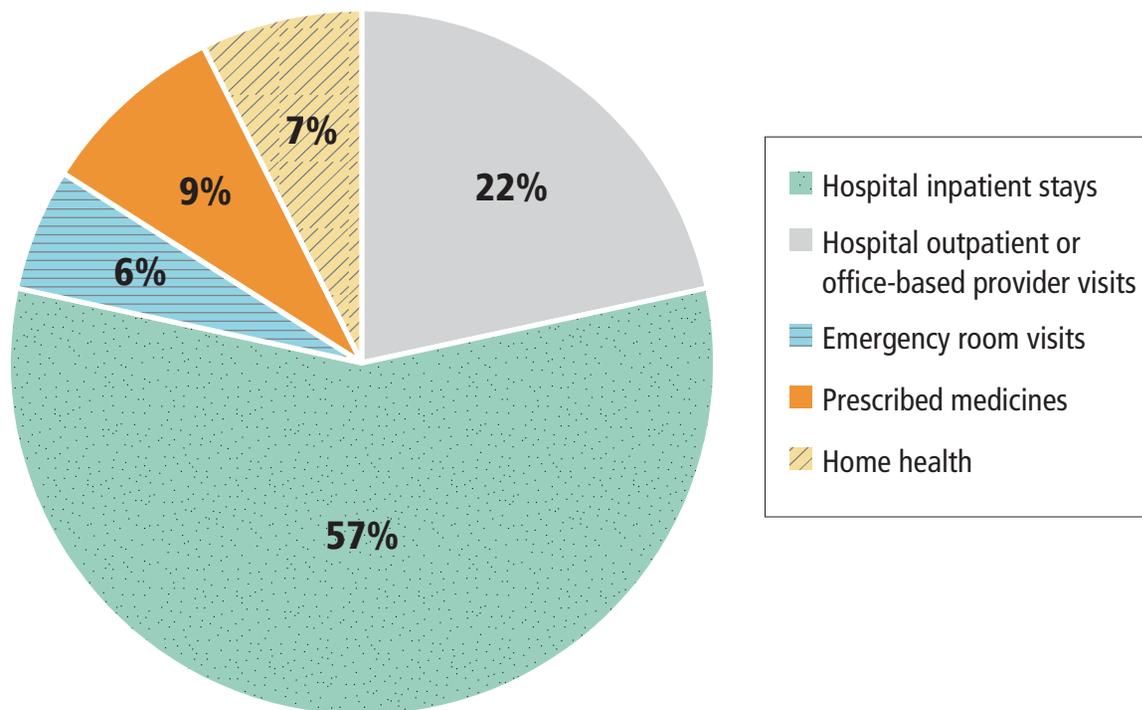
- ▶ This distribution of total costs across genders was similar for heart attack, but differed from total costs of stroke hospitalizations in Oregon, where males and females accounted for roughly 50% of total costs (see Volume 5: The Burden of Stroke in Oregon 2013).
- ▶ Nationally, \$99.2 billion was spent on direct economic costs associated with heart disease.<sup>22</sup>

**FIGURE 4.6.2 TOTAL COSTS OF HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, BY GENDER, OREGON, 2011**



**Data source:** Oregon Hospital Discharge Dataset

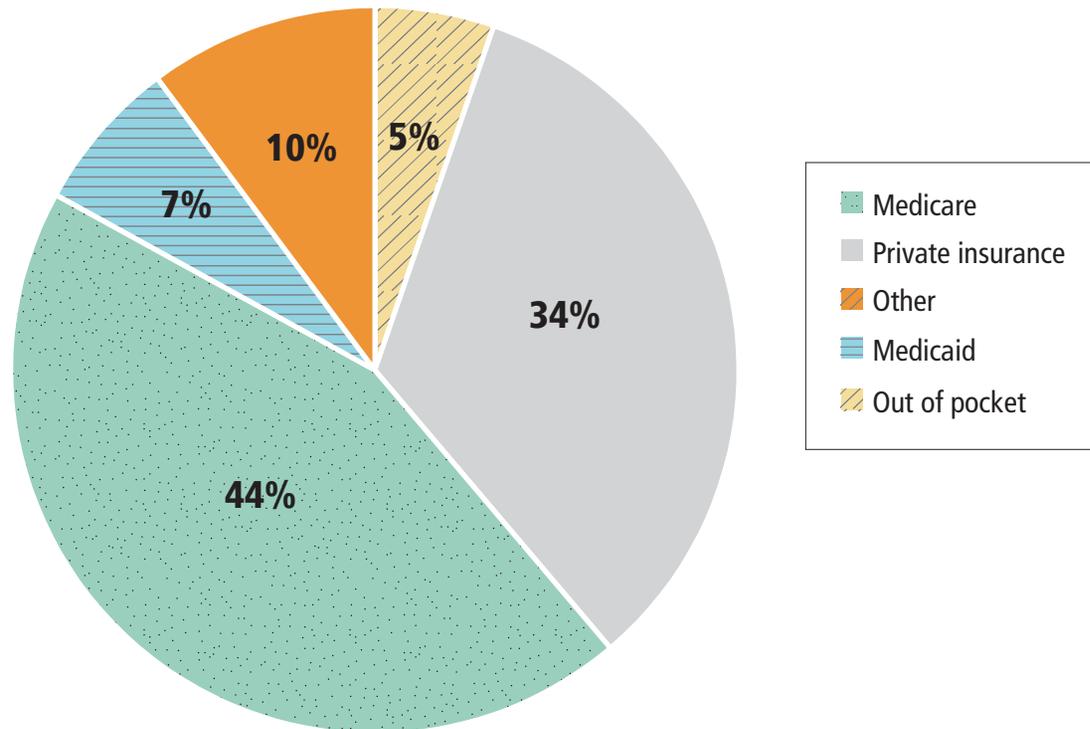
**FIGURE 4.6.3 DISTRIBUTION OF DIRECT ECONOMIC COSTS OF HEART DISEASE, BY TYPE OF SERVICE, UNITED STATES, 2009**



**Data source:** National Heart, Lung and Blood Institute, Disease Statistics

- ▶ Of the direct costs due to heart disease, more than half (57%) were attributable to hospital inpatient stays, which equates to more than \$46 billion (Figure 4.6.3).
- ▶ Nearly one-quarter (22%) of direct heart disease costs were attributable to hospital outpatient or office-based provider visits, 9% to prescribed medicines, 7% to home health and 6% to emergency room visits (Figure 4.6.3).<sup>22</sup>

FIGURE 4.6.4 PERCENT DISTRIBUTION OF MEDICAL EXPENSES FOR HEART DISEASE, BY SOURCE OF PAYMENT, UNITED STATES, 2010



Data source: Medical Expenditure Panel Survey

- ▶ According to national data from 2010, 44% of heart attack medical expenses were paid by Medicare, 34% by private insurance, 7% by Medicaid, 5% out of pocket and 10% from some other source (Figure 4.6.4).<sup>23</sup>

## Conclusions

Lowering the cost of health care is one component of the Oregon Health Authority Triple Aim framework for optimizing health systems performance, which also includes improving the patient experience of care and improving the health of populations.<sup>24</sup> With current heart disease prevention and treatment trends, the direct medical costs associated with heart disease care are projected to increase by 198% during the next 20 years, from \$35.7 billion in 2010 to \$106.4 billion in 2030.<sup>25</sup> In addition, the indirect costs associated with lost productivity due to heart disease are projected to increase by 53%, from \$73.2 billion in 2010 to \$112.3 billion in 2030.<sup>25</sup> However, these projections do not need to become a reality; heart disease and heart attack are largely preventable.

Heart disease and heart attack prevention include living tobacco-free, moving more, eating a diet high in fresh fruits and vegetables and low in sodium and artificial trans fats, maintaining a healthy weight and managing high blood pressure and high cholesterol. Communities can support individuals in the prevention and management of heart disease and heart attack by establishing tobacco-free environments, increasing access to fresh fruits and vegetables, increasing opportunities for physical activity and reducing sodium and trans fats in the food supply.



# WAYS TO REDUCE HEART DISEASE AND HEART ATTACK IN OREGON

Heart disease and heart attack can be prevented or managed by living tobacco-free and limiting exposure to secondhand smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats.<sup>4</sup>

These conditions can also be prevented by controlling existing medical conditions such as high blood pressure, high cholesterol, diabetes, and overweight and obesity.<sup>4</sup> People who have been identified as being more susceptible to having a heart attack — including those with a family history of heart disease, older adults, men and African American persons — should be aware that their predisposition to heart disease in combination with an unhealthy lifestyle further increases the risk for heart disease and heart attack.

Our social and physical environments are powerful influencers, affecting what we eat, how we live and how healthy we are throughout our lifetime. Today in Oregon, nutritious food and places to play and exercise are out of reach for many people. All Oregonians deserve convenient access to nutritious foods and activities that help them live better. Healthy options should be available to all Oregonians and not dependent on income, educational attainment, race or ethnicity. Oregon is committed to the Million Hearts<sup>®</sup> initiative, preventing heart disease and stroke by addressing the ABCS — appropriate **A**spirin therapy, **B**lood pressure control, **C**holesterol control, **S**moking cessation and reduced **S**odium consumption — through these evidence-based policy strategies:

- ▶ Tobacco-free environments and helping cigarette smokers quit;
- ▶ Improved access to evidence-based quality care;



- 
- ▶ Healthy worksites that encourage healthy eating and offer opportunities for physical activity;
  - ▶ Environments with limited access to foods high in sodium and trans fats.

Some programs currently offered by the Oregon Health Authority that help individuals with heart disease and heart attack prevention behaviors include the Oregon Tobacco Quit Line (<https://public.health.oregon.gov/PreventionWellness/TobaccoPrevention/GetHelpQuitting/Pages/oregonquitline.aspx>), Walk with Ease ([www.arthritis.org/resources/community-programs/walk-with-ease/](http://www.arthritis.org/resources/community-programs/walk-with-ease/)) and Living Well with Chronic Conditions (<http://public.health.oregon.gov/diseasesconditions/chronicdisease/livingwell/Pages/Index.aspx>) programs. The Oregon Tobacco Quit Line provides free tobacco cessation coaching to help people live tobacco-free. Walk with Ease, a gentle exercise program that addresses the risk factor of physical inactivity by increasing walking among participants, and Living Well with Chronic Conditions and Tomando Control de su Salud, programs that teach people living with chronic conditions the skills to take care of themselves, are offered throughout the state.

Oregon also promotes and supports strategies to improve delivery and use of quality clinical services to prevent heart disease and heart attack and manage risk factors. These include increased blood pressure screenings and increased clinical referrals to evidence-based prevention and self-management education and support services.

Visit the Oregon Heart Disease and Stroke Prevention webpage for more information and heart disease prevention resources: <http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/HeartDiseaseStroke/Pages/index.aspx>.

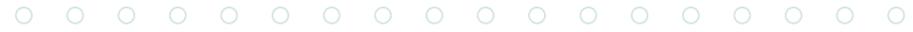


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# APPENDIX A: COUNTY-LEVEL ESTIMATES



**TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011**

	Diabetes		Heart attack		Heart disease	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	7.2%	–	9.9%	–	3.5%
<b>County</b>						
<b>Baker</b>	11.2%	10.0%†	6.1%†	7.5%	6.0%†	6.4%†
<b>Benton</b>	6.8%	7.5%	2.5%	10.8%	2.5%	2.5%*
<b>Clackamas</b>	8.1%	7.5%	2.9%	9.5%	2.9%	2.6%*
<b>Clatsop</b>	8.7%	7.5%	6.5%	5.9%*	4.9%	3.8%
<b>Columbia</b>	8.4%	7.5%	2.9%	11.3%	3.5%	3.0%
<b>Coos</b>	12.4%	10.9%	7.6%	18.1%*	8.5%	7.3%†
<b>Crook</b>	10.2%	9.1%	4.7%†	6.8%†	2.8%†	2.0%†
<b>Curry</b>	9.7%	6.8%	6.5%	8.8%	7.5%	4.9%
<b>Deschutes</b>	6.6%	5.8%	2.8%	9.2%	3.5%	2.9%
<b>Douglas</b>	12.8%	11.2%*	6.7%	14.2%*	4.4%	3.2%
<b>Grant</b>	8.3%†	5.8%†	3.5%†	12.1%†	4.7%†	2.6%†
<b>Harney</b>	9.0%†	7.7%†	–	15.1%†	–	–
<b>Hood River</b>	6.1%†	5.3%†	–	2.2%†	–	–
<b>Jackson</b>	8.6%	7.8%	3.8%	9.1%	3.8%	3.2%
<b>Jefferson</b>	6.1%†	5.3%†	5.3%†	9.2%†	2.6%†	2.0%†
<b>Josephine</b>	10.3%	7.6%	6.6%	10.6%	6.6%	4.7%
<b>Klamath</b>	8.0%	7.0%	6.4%	14.1%	4.0%	3.3%

TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011, CONTINUED

	Diabetes		Heart attack		Heart disease	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	7.2%	–	9.9%	–	3.5%
<b>County</b>						
Lake	7.6%†	4.9%†	7.9%†	7.2%†	5.1%†	3.3%†
Lane	7.4%	6.9%	3.9%	11.7%*	3.6%	3.1%
Lincoln	10.4%	7.8%	4.1%	9.6%	3.9%	2.7%
Linn	8.6%	7.3%	4.3%	9.9%	5.4%	4.4%
Malheur	10.5%	10.3%	3.4%†	9.3%	4.1%†	4.0%†
Marion	7.8%	7.6%	3.8%	9.2%	4.4%	4.1%
Morrow	7.3%†	6.6%†	4.1%†	6.6%†	5.8%†	5.6%†
Multnomah	6.5%	6.6%	2.7%	8.9%	3.7%	3.7%
Polk	8.3%	7.5%	6.6%	10.6%	6.2%	5.8%
Tillamook	12.8%	11.2%	5.4%	6.4%*	5.3%	3.3%
Umatilla	9.6%	9.4%	4.0%	9.1%	2.3%	2.1%*
Union	9.1%†	8.6%†	3.8%†	13.5%	4.0%†	3.4%†
Wallowa	7.1%†	5.0%†	4.6%†	6.2%†	6.6%†	4.4%†
Washington	5.8%	6.0%*	2.5%	9.6%	2.9%	3.1%
Wheeler	–	–	–	–	–	–
Yamhill	6.1%	6.0%	4.2%†	9.3%	4.2%	4.0%
Gilliam/Sherman/ Wasco	8.1%	6.6%	6.3%	7.5%†	5.6%	4.9%†

\* Statistically significant difference compared with all other counties ( $p$ -value  $\leq 0.05$ )

† This number may be statistically unreliable and should be interpreted with caution.

– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).

TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

	Stroke		High blood pressure		High cholesterol	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	2.3%	–	26.6%	–	32.2%
<b>County</b>						
<b>Baker</b>	5.3%†	–	40.4%	32.8%	56.4%	51.7%
<b>Benton</b>	1.5%	1.6%*	20.9%	21.5%	29.1%	27.8%
<b>Clackamas</b>	2.5%	2.2%	28.9%	27.0%	37.1%	33.1%
<b>Clatsop</b>	4.2%	3.1%	35.6%	31.2%	41.3%	28.4%
<b>Columbia</b>	2.7%†	2.5%†	32.7%	29.4%	40.7%	29.8%
<b>Coos</b>	6.2%†	5.9%†	32.9%	26.1%	39.8%	35.2%
<b>Crook</b>	–	–	42.4%	38.3%	48.3%	42.9%
<b>Curry</b>	2.5%†	1.3%†	35.8%	22.7%	44.9%	29.3%
<b>Deschutes</b>	1.8%	1.5%*	24.6%	21.2%*	38.0%	37.8%
<b>Douglas</b>	4.3%	3.3%	36.8%	33.1%*	43.5%	38.4%
<b>Grant</b>	–	–	37.3%	22.8%	54.2%	68.3%*
<b>Harney</b>	–	–	21.3%†	14.4%*	39.1%	37.8%†
<b>Hood River</b>	–	–	23.2%	20.6%	16.2%	12.1%*
<b>Jackson</b>	2.7%	2.1%	32.0%	29.0%	41.6%	34.0%
<b>Jefferson</b>	1.8%†	1.4%†	21.9%	17.6%*	38.6%	24.0%
<b>Josephine</b>	3.2%	2.4%	35.5%	29.7%	38.2%	26%*
<b>Klamath</b>	3.4%	3.2%	33.7%	30.6%	44.0%	39.7%
<b>Lake</b>	–	–	32.2%†	22.1%	58.8%	51.0%
<b>Lane</b>	2.4%	2.1%	28.3%	26.8%	39.1%	33.7%

TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

	Stroke		High blood pressure		High cholesterol	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	2.3%	–	26.6%	–	32.2%
<b>County</b>						
<b>Lincoln</b>	3.7%	2.8%†	39.6%	35.1%	45.4%	34.8%
<b>Linn</b>	3.9%	3.6%	28.8%	26.3%	33.8%	28.4%
<b>Malheur</b>	1.6%†	1.4%†	29.3%	26.0%	30.3%	21.7%*
<b>Marion</b>	3.0%	2.8%	27.9%	27.2%	33.6%	29.8%
<b>Morrow</b>	–	–	29.1%	22.9%	41.6%	27.5%
<b>Multnomah</b>	1.9%	2.0%*	26.1%	26.1%	35.1%	32.4%
<b>Polk</b>	1.5%	1.3%*	25.9%	24.4%	36.4%	30.5%
<b>Tillamook</b>	3.8%†	3.0%†	27.9%	20.4%	47.0%	44.9%
<b>Umatilla</b>	3.7%	3.4%	32.7%	32.1%	47.6%	42.6%*
<b>Union</b>	2.9%†	2.3%†	31.8%	28.8%	41.3%	40.0%
<b>Wallowa</b>	5.8%†	–	43.7%	28.7%	44.6%	35.2%
<b>Washington</b>	2.1%	2.1%	23.5%	24.2%*	32.2%	28.6%*
<b>Wheeler</b>	–	–	–	–	–	–
<b>Yamhill</b>	2.2%	2.0%	27.8%	26.9%	35.3%	32.7%
<b>Gilliam/Sherman/ Wasco</b>	2.4%†	1.6%†	37.8%	34.1%	35.6%	27.3%

\* Statistically significant difference compared with all other counties (p-value <= 0.05)

† This number may be statistically unreliable and should be interpreted with caution.

– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).

TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

	Obese		Current cigarette smoker		Lack of physical activity	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	<b>24.8%</b>	–	<b>16.3%</b>	–	<b>17.5%</b>
<b>County</b>						
<b>Baker</b>	26.6%	26.6%	23.0%	26.4%*	27.7%	31.7%*
<b>Benton</b>	18.1%	18.7%*	10.3%	10.2%*	13.4%	13.9%
<b>Clackamas</b>	24.0%	23.9%	14.0%	14.3%*	15.7%	15.4%*
<b>Clatsop</b>	30.5%	31.4%	19.6%	20.3%	18.3%	17.5%
<b>Columbia</b>	24.7%	23.7%	18.2%	19.2%	19.2%	18.9%
<b>Coos</b>	30.0%	30.0%*	24.8%	28.3%*	21.7%	19.8%
<b>Crook</b>	25.5%	25.6%	16.7%	17.4%	19.4%	18.7%
<b>Curry</b>	30.1%	31.5%	24.5%	32.3%*	25.5%	25.1%
<b>Deschutes</b>	17.4%	17.2%*	13.1%	13.8%	18.1%	18.2%
<b>Douglas</b>	32.5%	33.6%*	23.8%	26.7%*	21.4%	20.9%
<b>Grant</b>	23.1%	21.8%	22.8%	26.2%	16.1%†	20.1%†
<b>Harney</b>	22.8%	22.7%	9.0%†	8.4%†	20.7%	18.5%
<b>Hood River</b>	19.5%	19.7%	9.2%	9.5%†	16.9%	16.9%
<b>Jackson</b>	21.0%	20.7%*	19.7%	21.2%*	15.2%	14.3%*
<b>Jefferson</b>	28.5%	28.7%	14.6%	15.4%	21.4%	20.7%
<b>Josephine</b>	21.7%	19.7%*	19.3%	21.3%*	22.1%	21.4%
<b>Klamath</b>	28.4%	29.4%	19.9%	20.6%	21.9%	21.6%
<b>Lake</b>	28.4%	27.1%	16.8%	19.2%†	21.0%	19.1%
<b>Lane</b>	26.4%	26.5%	17.6%	18.1%	16.8%	16.6%

TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

	Obese		Current cigarette smoker		Lack of physical activity	
	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted	Unadjusted	Age-adjusted
<b>OREGON</b>	–	<b>24.8%</b>	–	<b>16.3%</b>	–	<b>17.5%</b>
<b>County</b>						
<b>Lincoln</b>	27.5%	26.6%	22.8%	27.4%*	21.3%	20.1%
<b>Linn</b>	30.5%	30.6%*	18.2%	19.0%	24.4%	24.6%*
<b>Malheur</b>	27.7%	27.9%	22.0%	22.9%	19.2%	18.3%
<b>Marion</b>	28.0%	28.0%*	14.2%	14.4%	18.1%	18.0%
<b>Morrow</b>	29.5%	29.7%	14.5%	14.7%	32.0%	31.3%*
<b>Multnomah</b>	22.4%	22.5%*	14.6%	14.5%*	14.9%	15.0%*
<b>Polk</b>	27.4%	27.2%	13.2%	14.2%	16.8%	16.4%
<b>Tillamook</b>	29.1%	27.9%	19.8%	23.0%	17.9%	15.3%
<b>Umatilla</b>	34.4%	34.8%*	20.6%	21.0%*	26.2%	26.2%*
<b>Union</b>	27.4%	28.1%	10.8%	11.6%	16.0%	16.3%
<b>Wallowa</b>	18.3%	18.1%	14.9%†	16.9%†	32.6%	35.1%†
<b>Washington</b>	21.9%	21.9%*	12.7%	12.6%*	16.7%	16.7%
<b>Wheeler</b>	22.6%†	–	12.1%†	–	–	–
<b>Yamhill</b>	34.8%	35.0%*	18.4%	18.5%	28.4%	28.2%*
<b>Gilliam/Sherman/ Wasco</b>	35.2%	35.3%*	13.7%	14.4%	19.6%	18.1%

\* Statistically significant difference compared with all other counties (p-value <= 0.05)

† This number may be statistically unreliable and should be interpreted with caution.

– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).

# APPENDIX B: DATA SOURCES



The data sources used in this report are listed below. Data sources are described with brief limitations.

### Behavioral Risk Factor Surveillance System (BRFSS)

Description: The BRFSS is a random-digit dialed telephone survey that is conducted year-round among Oregon adults aged 18 years or older. The BRFSS includes questions on health behavior risk factors such as diet, weight control, tobacco and alcohol use, physical activity, preventive health screenings, and use of health care services. The data are weighted to represent all adults aged 18 years and older. A core set of questions is asked annually, and other topics are surveyed on a rotating basis.



Every few years, Oregon conducts additional BRFSS surveys among under-represented races and ethnicities.

The results of these surveys are combined with statewide BRFSS data to provide more stable estimates for chronic diseases and related risk factors among these groups of Oregonians. The most recent race/ethnicity oversamples were conducted in 2010–2011. In addition, BRFSS surveys from 2008–2011 were aggregated to produce more reliable county-level prevalence estimates.

Starting in 2010, Oregon began collecting data from those who use cell phones, causing the method for adjusting (weighting) the data to the demographics of the state to change. This new method is called “raking.” Because of these changes, data prior to 2010 are not directly comparable to the data from 2010 forward. In addition, the national BRFSS also made these changes but did not implement the changes until 2011.

**Limitations:** BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.



## Hospital Discharge Dataset

**Description:** The Hospital Discharge Dataset provides information on hospital discharges from all acute care hospitals in Oregon except two Veterans Administration hospitals. The dataset includes admit and discharge dates, diagnosis and procedural codes, financial charges, primary payer, and patient demographic information.

**Limitations:** Prior to 2008, the Hospital Discharge Dataset did not include identifying information that would allow us to ascertain when a single person had multiple hospitalizations; therefore, the calculated rate was the number of hospitalizations per the Oregon population rather than number of different people hospitalized per the Oregon population. In addition, prior to 2008, the dataset did not include information on race or ethnicity. Starting in 2008, the data necessary for investigating repeat hospitalizations for chronic diseases and hospitalizations by race/ethnicity were available and reported.

## Oregon Health Panel Survey (OHPS)

**Description:** The Oregon Health Panel Survey was conducted in 2012 among non-institutionalized adults aged 18 years or older. Panel members were recruited using random digit dialing sampling based on landline telephone numbers and/or address-based sampling methodologies. A sample of panel members was then drawn at random for the survey. Topics on the survey include knowledge and attitudes toward colorectal screening, trans fats, sugary drinks, and other tobacco products. The data are weighted to represent all adults aged 18 years and older.

**Limitations:** OHPS estimates pertain only to the adult population aged 18 years or older living in households.

## Oregon Healthy Teens (OHT) Survey

**Description:** Since 2000, the Youth Risk Behavior Survey (developed by the CDC) and the Oregon Public School Drug Use Survey were combined for Oregon into a single annual survey called Oregon Healthy Teens (OHT) Survey. The sample size varies from 1,600 to 32,000 per year, and the final data are weighted to more accurately represent Oregon eighth- and 11th-graders. The survey assesses health topics such as tobacco and alcohol use, HIV knowledge and attitudes, eating behaviors, nutrition and exercise.

**Limitations:** One limitation is that participation by school systems in the OHT is voluntary. However, participation rates have been high thus far. Another limitation is that the OHT questionnaire is not currently available in non-English versions except for a Spanish booklet that can be used as a reference when filling out the English version of the survey. A third limitation is that 3% of surveys were eliminated due to combinations of “dubious” answers and another 5% were eliminated because the student did not fill out grade or gender information.

## Vital records data (full count data)

### Birth Certificate Statistical File

The Birth Certificate Statistical File includes all births occurring in Oregon and births occurring out of state to Oregon

residents. This database includes parental demographic information, conditions of the newborn, congenital abnormalities, medical factors of pregnancy, method of delivery, and complications of labor and delivery. It also includes tobacco, alcohol or illicit drug use during pregnancy. Information about maternal diabetes and gestational diabetes is also included.

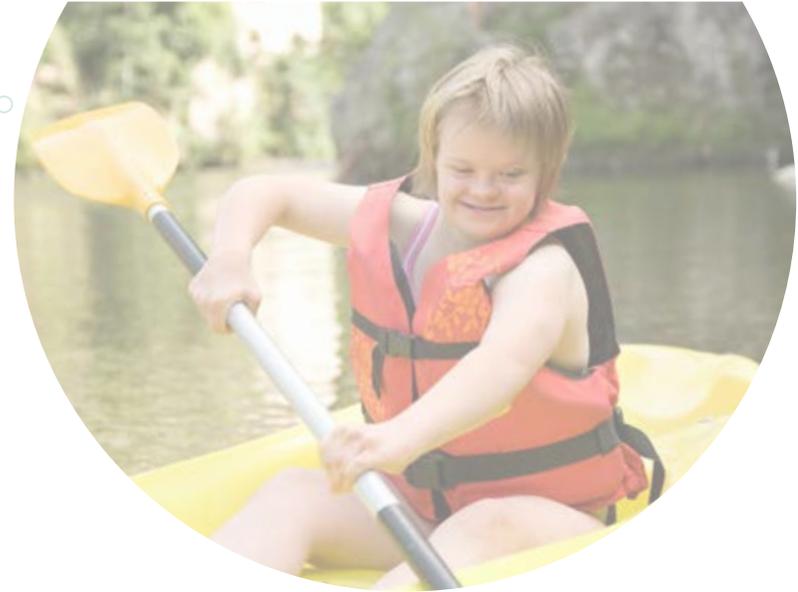
### **Death Certificate Statistical File**

The Death Certificate Statistical File includes all deaths occurring in Oregon and deaths occurring out of state to Oregon residents. Data are obtained from death certificates that are collected from the state registrar. The data are used to examine trends in mortality and causes of death. This database includes cause of death, date and place of death, and decedent demographic information. The mortality data analyzed for this report consists of deaths among Oregon residents.

**Limitations of birth and death files:** The accuracy of the data depends on the accuracy with which the birth attendant, certifying physician or medical examiner describes the circumstances surrounding the birth or the underlying causes of death.

### **CDC Wonder database**

The CDC Wonder database provides National Center for Health Statistics (NCHS) national statistical analysis and reporting of deaths from specific diseases.



# APPENDIX C: RELIABILITY AND SUPPRESSION GUIDELINES



In this report, some numbers include a warning that they are potentially unreliable or they are unreliable and suppressed (not shown). In general, reliability refers to the stability of a number being reported.

The guidelines used to gauge reliability differ depending on the type of data used. Some data sources include all events under study (such as births, deaths or hospitalizations). These will be referred to as “full count.” Other data sources are from surveys of randomly selected individuals, adjusted to represent the full population. These will be referred to as “survey.” The text below briefly describes the methods used to determine if the information in this report includes a warning for reliability or is suppressed.

## Full count

Determine the number of events ( $n$ ).

- ▶  $n \geq 12$ : Report the estimate.
- ▶  $n \geq 5$  and  $n < 12$ : Report the estimate and include a warning regarding reliability.
- ▶  $n < 5$ : Do not report the estimate and state that it is suppressed.

## Survey

Determine the total number of persons surveyed ( $x$ ) for a particular question and calculate the standard error (SE) for the reported number. Use the SE to calculate a statistic called the relative standard error (RSE). RSE is a measure of the variability of an estimate compared with the estimate itself.



1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).
2. If the full population, determine if the denominator is  $\geq 50$ . If yes, proceed; if not, suppress.
3. If a subpopulation, determine if the denominator is  $\geq 20$ . If yes, proceed; if not, suppress.
4. Apply the following logic to each RSE:
  - RSE  $< 30\%$ : Report the estimate.
  - RSE  $\geq 30\%$  and RSE  $< 50\%$ : Report the estimate and include a warning regarding reliability.
  - RSE  $\geq 50\%$ : Do not report the estimate and state that it is suppressed.





**Oregon Health Authority, Public Health Division  
Health Promotion and Chronic Disease Prevention Section  
800 N.E. Oregon St., Suite 730  
Portland, OR 97232  
971-673-0984**

**<https://public.health.oregon.gov/DiseasesConditions/ChronicDisease/Pages/pubs.aspx>**

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